

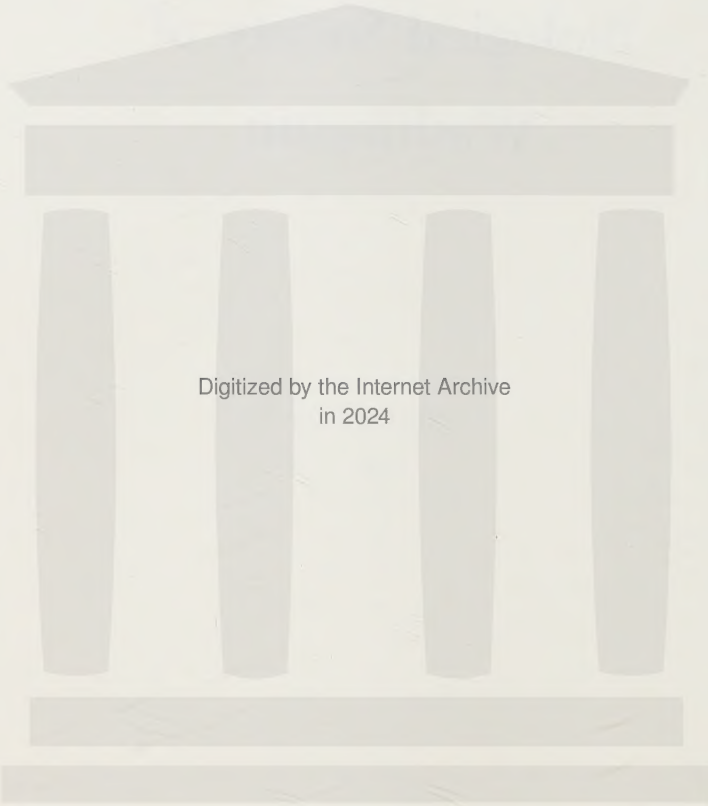
PROCEEDINGS
OF THE
Biological Society of
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PROCEEDINGS
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PROCEEDINGS

The two meetings during 1960 were held in Room 43 of the United States National Museum.

1029th Meeting — 16 June 1960

EIGHTY-FIRST ANNUAL MEETING

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Formal Communication: Mr. Leonard M. Llewellyn, Patuxent Wildlife Research Center: The mammal fauna of the Patuxent Wildlife Research Center.

1030th Meeting — 20 October 1960

President Johnson in the chair; 21 members present.

Formal Communication: Dr. Joseph Curtis Moore, Research Associate, American Museum of Natural History: Stream piracy and the distribution of squirrels in the Indo-Chinese area.

PROCEEDINGS
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SUGGESTIONS TO AUTHORS CONTRIBUTING TO THE
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References in the text should be cited by author, with date and page in parentheses, as follows: Linnaeus (1758:306). For papers by one author in the same year, use letters following the date, as follows: Jones (1929b:422).

In matters of style the Proceedings of the Biological Society of Washington will follow as closely as possible the standards

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PUNCTUATION, ETC.: United States Government Printing Office Style Manual.

A Manual of Style. The University of Chicago Press.

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Strunk, William. The Elements of Style. Macmillan Company.

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PROCEEDINGS
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A NEW SUBSPECIES OF FURNARIIDAE FROM
VENEZUELA AND EXTENSIONS OF RANGES

BY WILLIAM H. PHELPS AND WILLIAM H. PHELPS, JR.

We wish to thank the Curators of the American Museum of Natural History for access to their collections during this research. Specimens listed are in the Phelps Collection, Caracas, unless otherwise specified. Names of colors are capitalized when direct comparison has been made with Ridgway's "Color Standards and Color Nomenclature," 1912. Wing measurements are of the chord.

***Hylcostistes subulatus lemae*, new subspecies**

Type: From Sierra de Lema, Gran Sabana, Bolívar, Venezuela; 1,000 meters. No. 64720-D, Phelps Collection, Caracas. Adult male, collected 12 February 1959, by Ramón Urbano. (Type on deposit at the American Museum of Natural History.)

Diagnosis: Nearest to *H. s. subulatus* (Spix) of southwestern Venezuela to Perú but differs from all subspecies by more olivaceous, less brownish breast and abdomen and by a darker back, also more olivaceous, less brownish; from *H. s. subulatus* it differs additionally by olivaceous instead of brownish sides, flanks and thighs, by more olivaceous, less brownish, striping of under parts and by more yellowish, less buffy chin.

Range: Known from the type locality in the upper Tropical Zone forest at kilometer 125 on the road from El Dorado on the Cuyuni River to the plateau of the Gran Sabana.

Description of Type: Top of head and neck dusky, the feathers with fine buffy olivaceous shaft streaks, giving a lined appearance; back Prout's Brown, feathers of mantle with very faint buffy shaft streaks; uropygium Sanford's Brown; lores dusky; ear-coverts dusky, faintly lined with buffy. Chin immaculate Pale Ochraceous-Buff X Light Ochraceous-Buff merging into the Warm Buff of lower throat and breast which are widely streaked with Dresden Brown, this merging into the Warm Buff of abdomen; sides and flanks Dresden Brown, under tail-coverts more rufous. Wings Antique Brown; inner webs of remiges Benzo Brown basally margined with Onion-skin Pink, more extensively internally; shafts of remiges dark brown above, yellowish white below; under wing-coverts and axil-

laries Apricot Buff. Upper surface of tail Mahogany Red, lower surface paler; shafts of tail feathers dark brown above, buffy below.

Bill (in life) "black, base greenish"; feet "greenish"; iris "brown." Wing, 81 mm; tail, 69; exposed culmen, 19.5; culmen from base, 23; tarsus, 20.

Remarks: Sexes alike. Size similar to *H. s. subulatus*. Range of measurements (including type): two adult males—wing, 79.2 mm; tail, 69; culmen from base, 22; two adult females—wing, 76; tail, 67.5; culmen from base, 22.7. Measurements of *H. s. subulatus* from Ecuador: five adult males—wing, 82; tail, 63; culmen from base, 23.2; five adult females—wing, 77.4; tail, 62.8; culmen from base, 22.8.

SPECIMENS EXAMINED

H. s. virgatus.—COSTA RICA—var. locs. 8.¹ PANAMÁ—9.²

H. s. assimilis.—PANAMÁ—2.² COLOMBIA—11.² ECUADOR¹—Chimbo, 1 ♂; Paramba, 1 ♂; Río de Oro, 1 ♀; Cochyacu, 1 ♀; Cachabí, 1 ♂, 1 ♀; Lita, 1 ♂; Coca, Río Napo, 1 ♂.

H. s. subulatus.—COLOMBIA¹—Florencia, 1 ♀; "Colombia," 1 ♂; Río Duda, Mt. Macarena, 1 ♂. ECUADOR—Vico, Río Curaray, 1 ♂¹; Cucutú, Oriente, 1 ♀¹; var. locs., 16.² PERU—3.² BRAZIL¹—Calamá, Río Madeira, 1 (?); Tatú, Río Negro, 1 (?). VENEZUELA—Alto Río Asisa, Terr. Amazonas, 2 ♂; Kabadisocaña, Alto Río Ventuari, 1 ♂; Sarariña, Alto Caura, Bolívar, 1 ♀; Sabana Canaracuni, 1 (?); Caño Tonoro, Río Paragua, 1 (?); Salto María Espuma, 1 ♀; Caño Seco, Duida, 1 ♂¹; Caño Desecho, 1 ♂.¹

H. s. lemae.—VENEZUELA—Sierra de Lema, Gran Sabana, Bolívar, 2 ♂, 2 ♀.

Tyranniscus uropygialis (Lawrence)

Mecocerculus uropygialis Lawrence, Ann. Lyc. Nat. Hist. New York, 9, p. 266, 1870. ("Ecuador.")

2 (?), Páramo La Negra, Mérida; 3,100 meters. Collected 2 Nov. 1958.

These specimens extend the range of the species to Venezuela from southern Colombia (Cundinamarca, Cauca and Nariño); de Schauensee, 1950:864,³ lists only subtropical localities in Colombia but Hellmayr, 1927:v-469,⁴ lists 10,000 feet in Bolivia.

Phrygilus unicolor geospizopsis (Bonaparte)

Passericulus geospizopsis Bonaparte, Comp. Rend. Acad. Sci. Paris, 37, No. 25, p. 921, 1853. ("Bogotá.")

1 ♂, 1 ♀, Páramo de Tamá, Táchira; 3,275 meters. Collected 28 February 1941.

These specimens constitute an extension of range of the subspecies to Venezuela from the Páramo Zones of Colombia.

The wing lengths of these specimens are: ♂, 90 mm; ♀, 84 mm. The wing lengths of specimens in our collection of *P. u. nivarius* (Bangs) from localities between Páramo La Negra, Mérida and Páramo El Cendé,

Trujillo, are: 26 ♂, 76.5 mm—83 (80.4). de Schauensee, 1951:1098, gives wing lengths of *geospizopsis* from Colombia as: 13 ♂, 88–100 (92.2).

Many of the subspecies from the Páramo de Tamá massif correspond to those of the Bogotá Region and not to those of the Mérida Region. There is no tropical interruption in the connecting Eastern Andes between Bogotá and the Páramo de Tamá while there is an upper tropical depression across the State of Táchira from San Cristobal to San Antonio separating the Tamá massif from the Cordillera de los Andes (Mérida Region).

¹ Specimens in American Museum of Natural History.

² *Idem.* For localities see Zimmer, Amer. Mus. Nov., No. 862, p. 10, 1936.

³ Birds of the Republic of Colombia.

⁴ Birds of the Americas, etc.

PROCEEDINGS
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STUDIES ON SPIROBOLOID MILLIPEDS. V. THE
CORRECT IDENTITY OF THE GENUS *RHINOCRICUS*,
BASED UPON A STUDY OF ITS TYPE SPECIES¹

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The great assemblage of spiroboloid millipeds which has been going under the name *Rhinocricus* has become, in the sense of current usage, the largest genus in the order Spirobolida (if not in the entire class Diplopoda) despite the periodic removal of small groups of its species under new generic names. Most rhinocricids adhere closely to a basic configuration of the male genitalia, while differing considerably in details of external body form, so that there has been little agreement among students of the group concerning either generic or specific definitions. This difficult situation is complicated by the fact that the gonopods of the type species of *Rhinocricus* have never been described. From 1894 to the present time, the genus has been defined inferentially by the characters of species only *presumed* to be congeneric with the true type!

The name *Rhinocricus* was first published by Ferdinand Karsch in 1881 as a subgeneric name under *Spirobolus*, and included 17 species none of which was designated as the type of the subgenus. In 1894, R. I. Pocock elevated *Rhinocricus* to the rank of genus, and properly selected as its type the species which Karsch described as *S. (R.) parvus* from specimens collected by Krug in Puerto Rico. Unfortunately, Pocock chose a form of which he had seen no specimens, and which was inadequately described to begin with. However, since most of the West Indian species of large spiroboloids were strictly congeneric, insofar as Pocock's generic concept was concerned, he

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assumed that *parcus* would likewise prove to represent the same genus.

With the subsequent refinement of generic and specific limits by Pocock's successors, however, it became evident that most of the older diplopod genera (including *Rhinocricus*) desirably should be fragmented into numerous smaller and more homogeneous groups the definition thereof depending chiefly upon the structure of the male genitalia. Down to the present, about 30 generic names have been proposed for various groups of rhinocricids, including a considerable number for West Indian forms. These names, unfortunately, have without exception been thrust into the literature solely upon the naive and myopic assumption that Pocock's original surmise about the identity of *R. parcus* was correct. This is unseemly. If we discard old ideas about generic limits we must in consistency hold in suspicion the old inferences about identities as well. It is most curious that Pocock did not take the trouble to borrow Karsch's type specimens, a precaution apparently disregarded by all subsequent workers, insofar as I can determine. Count Attems found a much easier, if unorthodox, way around the difficulty: in 1914 he merely stated that *Rhinocricus beauforti* Attems (which at that time had not even been described!) was the type species of *Rhinocricus* in the strict sense.

It can be appreciated that as things still stand, the family Rhinocricidae has had all the nomenclatorial stability of a house of cards, and that eventually something would have to be done about the identity of the true type species of the typical genus. The matter was nearly solved in 1941 when H. F. Loomis reported the collection of *R. parcus* (the identification almost certainly correct) in Puerto Rico by Dr. P. J. Darlington. Unfortunately no males were taken; Loomis could only note details of body form and sculpture, but his account is the only published record of the species since the time of its description.

In face of the probability that the original types of *R. parcus* are now either lost or destroyed, the eventual resolution of the problem has seemed to depend upon the collection of topotypical specimens from Puerto Rico. Fortunately, however, this requirement was recently obviated, and dispatch of the *Rhinocricus* question greatly accelerated, by a series of events including the following: (1) following the death of Dr. O. F.

Cook in 1949 a considerable quantity of his myriapod collection was returned to the U. S. National Museum, (2) the efforts of curator Ralph E. Crabill have resulted in reconditioning and assembling for the first time all of the Museum's extensive holdings in myriapod groups, and (3) the present writer was enabled to devote abundant time and effort to the examination of said material. During this activity two very interesting items were found: a microscopic slide mount of one of the posterior gonopods of the male cotype of *R. parvus*, and a jar containing several collections of a rhinocricid from Puerto Rico which agrees in every detail with the aforesaid slide mount. As there can be no doubt that these specimens are strictly conspecific with the cotypes of *Rhinocricus parvus*, it is now possible to establish the characters of the genus.

Unfortunately, *Rhinocricus parvus* is clearly not congeneric with the great majority of American species which have traditionally been included in *Rhinocricus*. These species will have to be covered with another (or several more) generic name, but since there is now some dissention about the definition of genera in the Rhinocricidae, this matter may be deferred for future settlement. *Rhinocricus* in the current usage is undoubtedly heterogeneous, but I do not think that arbitrary groupings on the basis of scobinae and antennal sensory cones will provide a natural generic system. A certain number of groups of American rhinocricids have been set off as genera on the basis of well-marked characters of the gonopods; these include *Cubocricus*, *Nesobolus*, and *Neocricus*, for instance. Some others appear to be fairly well defined by non-sexual developments, such as the species of *Thyroproctus* and *Oxypyge*. Remaining is a great residue of species with basically similar gonopods, the posterior pair of which (the phallopods) terminate in a larger, hyaline, laminate blade, and a much smaller, more falciform branch from about the midlength of the telopodite. This configuration is the common denominator for a large number of species of most variable size, shape, and external structure which have generally been considered as "*Rhinocricus*" by virtually all workers. The presence or absence of scobinae, number of antennal sensory cones, and production of the epiproct into a caudal projection have all been used both singly and in combinations to define various "genera," but it

is my conviction that such characters cut across genera based upon gonopod structure, and are at best of specific value. Obviously, most of the numerous American species described in *Rhinocricus* (as well as the several artificial satellite genera) will have to be carefully restudied, particularly with reference to the normally concealed internal parts of the gonopods, before a rational generic classification can be achieved. In recent years the present writer has suggested a redefinition of *Eurhinocricus* on the basis of gonopod structure instead of external characters, but even this does not result in a clearly distinct group of species.

At the present, however, there seems to be no question about the distinctness of the group of species having a simple, falciform phallopod, which was designated as *Cubocricus* in 1922 by R. V. Chamberlin, and to which *R. parvus* clearly is referable. The restriction of *Rhinocricus* to this ensemble throws open the problem of which of the numerous existing generic names are to be used for the redefined American genera. This matter will be simplified somewhat by the compilation of spiroboloid generic names (now in press) prepared by Dr. Keeton and me, but it may be mentioned in passing that the second oldest available name (discounting both *Oxypyge* and *Thyroproctus*) for consideration—*Anadenobolus* Silvestri—poses a serious difficulty. It was based upon *Spirobolus politus* Porat (1888) from Antigua, a species first referred to *Rhinocricus* by Pocock in 1894. Porat's types were females, and insofar as I know, topotypical males remain to be secured. Until this be done, *Anadenobolus* will remain an outstanding hazard to further nomenclatorial stability in the family.

Genus *Rhinocricus* Karsch

Rhinocricus Karsch, 1881, Zeitschr. Naturwiss., 54: 68 (as subgenus of *Spirobolus*).—Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 485. *Cubocricus* Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5 (orthotype: *Rhinocricus suprenans* Chamberlin, 1918). NEW SYNONYMY.

Type species: *Spirobolus* (*Rhinocricus*) *parvus* Karsch, 1881, by subsequent designation of Pocock, 1894.

Diagnosis: Medium to large rhinocricids characterized by the form of the male gonopods: coleopods typical in form for the family but with deep cavities between coxae and sternite on the anterior side; phallopods with the telopodite slender, unbranched, and falciform. In the known

species antennal sensory cones are numerous and ventral tarsal pads are present in males on at least the anterior legs.

Range: Cuba and Puerto Rico [Hispaniola?].

Species: Four are definitely known. In addition, Loomis (1936) considered *Julus haitiensis* Gervais to be congeneric with the Cuban species, although this allocation will have to be verified. The discovery of species of *Rhinocricus* in Hispaniola is anticipated.

Remarks: The remarkable similarity of the Antillean genus *Rhinocricus* to *Acladocricus* of the East Indian region cannot be overlooked. I have had no species of the latter genus for study, but literature descriptions indicate virtual concordance in gonopod structure with typical species of *Rhinocricus*, and if future comparison of specimens can reveal no differences, *Acladocricus* (Brolemann, 1913) will fall as a junior subjective synonym of *Rhinocricus*. The resulting generic discontinuity finds a parallel, among diplopods, at least in the archaic genus *Glomeridesmus*, and numerous families are now largely restricted in their distribution to the two Indies.

In addition to a redescription of *R. parvus*, I include here a roster of its congeners with literature references and some descriptive notes, which should for the present obviate the preparation of a key. As the gonopods are quite similar in all of the known species, specific characters must be drawn largely from details of body form.

Rhinocricus parvus Karsch
Figs. 1-4

Spirobolus (*Rhinocricus*) *parvus* Karsch, 1881, Zeitschr. Naturwiss., 54: 68.

Rhinocricus parvus Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 485.—Loomis, 1941, Bull. Mus. Comp. Zool., 88: 38, fig. 11.

Type specimens: Cotypes, a male and female, collected by Krug in Puerto Rico, originally in the Berlin Museum (present condition unknown). One phallopod and the first legpair of the male in the U. S. Nat. Mus., Diplopod Type slides 1 and 2.

Diagnosis: A small member of the genus with large, deep scobinae on segments 8-12 and with prominent tarsal pads on all legs of the males.

Descriptive notes (adult male from Aguirre): A robust, stout-bodied spiroboloid, length ca. 85 mm, greatest diameter, 10.5 mm. Color largely faded from long preservation. Body with 43 segments.

Head small, moderately convex, smooth and polished; vertigial and clypeal sutures very short and indistinct, latter detectable nearly to level of antennal sockets. Labrum distinct, recessed below level of clypeus, with three distinct labral teeth all of equal length but the median somewhat the largest. Labral setae 10-10, stout, decurved; clypeal setal foveolae 2-2, the four pits set exactly equidistant from each other. Genae very slightly depressed below antennae, the ventral half of the edges round and immarginate but dorsal half set off by a fine marginal groove. Parietal sclerite distinct, with the shape of an elongate right triangle, its lateral

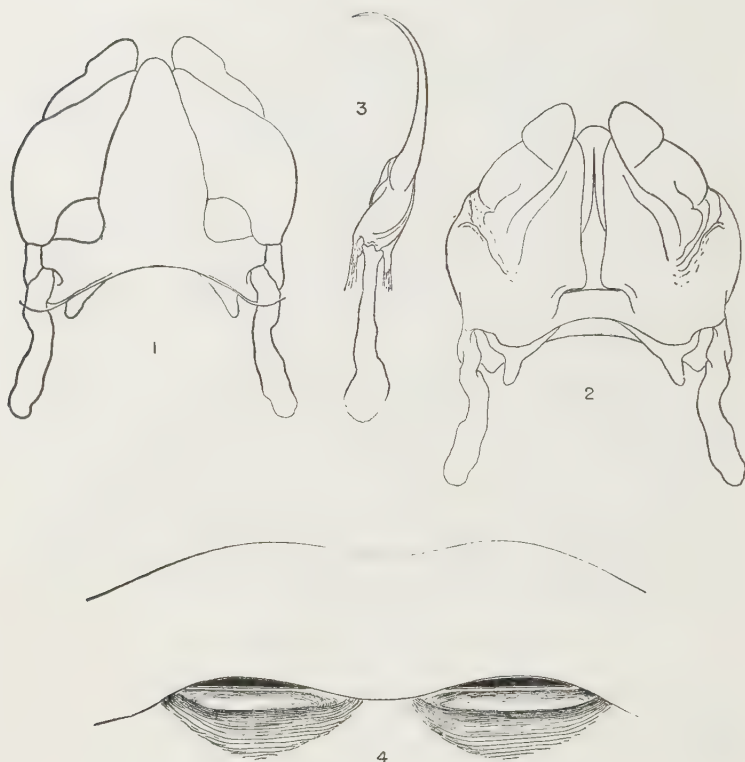


FIG. 1-4

edge set off by a broad elevated margin, the plate otherwise smooth and flat, continuing slope of the head. Ocellaria small and ovoid, about the size of an antennal socket, separated by a distance about 4 times an ocellarian diameter; each with 24 ocelli in 6 rows, those of the ventralmost row largest.

Antennae of moderate length, attaining base of 3rd segment when appressed caudally; antennal articles generally subequal in size except the 2nd, longest, and 6th, widest; the three basal articles glabrous, the four distal becoming increasingly setose; 7th article short, broad, and flattened, with about 20 sensory cones.

Collum broad, smooth, symmetrical, the anterior lateral marginal groove indistinct and short, not extending up as far as edge of the parietal sclerite. Pleurotergite of 2nd segment produced cephaloventrad below ends of collum, this portion with a few indistinct grooves.

Prozonites of most body segments with a few fine transverse striae on the anterior half; mesozonites and metazonites smooth, but the former with a distinct median suture across the dorsum between the lateral longi-

tudinal sutures. Ozopores large and distinct, located in the mesozonites considerably below the level of the lateral sutures (as shown in Fig. 11 of the 1941 paper by Loomis), the peritreme smooth and polished, very slightly elevated.

Scobinae (Fig. 4) very large and transverse, occurring on segments 8–13, with the posterior edge of the preceding segments slightly concave in front of each scobina.

Pleurites and lower parts of mesozonites and metazonites with very fine striae, these turning dorsad and merging with the transverse striae of the prozonite. Pleurites about two-thirds as wide as long, flat except for the distinctly depressed caudal third. Sternites flat, with about 10–12 distinct transverse striae; stigmata smooth and polished, the stigmal opening longitudinally ellipsoid, each located in a circular depression confined entirely to the sternum.

Legs very short, not attaining level of sides of body when extended and thus invisible in dorsal aspect, the joints smooth and polished, ventral setae 1-1-1-1-2, pretarsus small, but slender and acute, with a large dorsal tarsal macroseta near its base. All tarsi with large and conspicuous ventral pads, also the ventral surface of the prefemora calloused and semi-membranous. Legs in front of gonopods without any sort of modifications.

Body tapering gradually over the last 15 segments, the two or three segments in front of the anal ring somewhat smaller in proportion and slightly telescoped. Anal segment smooth, with a broad, bluntly triangular epiproct which does not cover more than basal half of the paraprocts. Latter large, only slightly convex, and with distinctly enlarged but not basally margined free edges. Hypoproct large, distinct, its free edge semicircular, extending laterally as far as ends of the femora of the last legpair.

Simpleurite of 7th segment narrow, simple, slightly elevated; with a trace of the median suture evident. Gonopods large, of the form shown in Figs. 1–3. Sternite of coleopods transverse and slightly arched, with a large triangular median projection as typical for the family, slightly surpassing apices of coxae but shorter than tips of telopodites. In anterior aspect, a deep, semicircular depression occurs on each side between sternite and base of coxae. Sternal apodeme of moderate length, slender, a little sinuous. Coxal apodeme short, bluntly acuminate, its base concealed by a small lobe of the coxal posterior edge. A distinct, darkly pigmented median piece separates the bases of the coxae. Telopodite of moderate size, vaguely articulated to the coxa, its distal reflexed lobe only slightly set off by a shallow groove. Phallopods completely separate, not completely concealed within the gonocoel of the coleopods, the apodeme slender at the base and abruptly enlarged and spatulate distally. Coxal portion of phallopod slender, flattened, showing some traces of torsion, merging evenly into the very slender, unbranched, falcate telopodite blade, the latter with the usual small basal enlargement of the seminal groove. In situ, the distal half of the telopodite projects beyond the apices of the coleopod.

Material examined: PUERTO RICO: Aguirre, 2 ♂ ♂, 2 ♀ ♀, June 1901;

Aibonito, 1 ♂, 28 June 1901; between Yauco and Guayanilla, 2 ♀ ♀, July 1901. All collections by O. F. Cook.

Variation: Meristic data were taken from the five mature specimens from Aguirre and Aibonito, 3 ♂ ♂ and 2 ♀ ♀. This small series shows considerable homogeneity and no evident sexual dimorphism. Length ranges from 70 to 90 mm (average 82 mm), diameter from 7.5 to 11.5 mm (10.1 mm); segments 43, 43, 43, 44, 45 (43.6); ocelli 24 to 30 (26.3) on each side; labral setae 16 to 22 (18.4). Scobinae occur on segments 8–12 in all except the described male, where they occur on segment 13 as well.

The cotypes measured 80 mm (♀) and 115 mm (♂) in length, both had 43 segments, and scobinae on segments 8–12. Loomis's female was 64 mm long, 9 mm in diameter, with 44 segments. Apparently the species is not a variable one.

Distribution: The specimens obtained by Dr. Cook originated from three localities on the southern half of Puerto Rico. The specimen taken by Darlington in June 1938 came from the Maricao Forest in the southwestern portion of the island, and it may be found that the species is restricted to the Cordillera Central and its southern foothills.

Rhinocricus duvernoyi Karsch

Spirobolus (*Rhinocricus*) *duvernoyi* Karsch, 1881, Zeitschr. Naturwiss., 54: 77.

Rhinocricus duvernoyi Pocock, 1894, J. Linnean Soc. London (Zool.), 24: 496—Chamberlin, 1918, Bull. Mus. Comp. Zool., 62: 193.

Cubocricus duvernoyi Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5.

Type specimen: Female, originally in the Berlin Museum (present status unknown), collected by Otto in Cuba.

Remarks: The characters of this species are difficult to make out from the original description which provides little more than generic details. Scobinae are said to extend from the 8th to 20th segment, segment number is 50, and the length 135 mm. Chamberlin (1918) associated the name with specimens from three localities in Cuba, representing a species having 49 to 53 segments and all but the most caudal legs of the males with tarsal pads.

Chamberlin's material came from Santiago de las Vegas and Guanajay, Pinar del Rio Province, and Guantanamo, in Oriente. One is inclined to wonder if perhaps the last record might not be mislabeled or otherwise spurious.

Rhinocricus suprenans Chamberlin

Rhinocricus suprenans Chamberlin, 1918, Bull. Mus. Comp. Zool., 62: 193.

Cubocricus suprenans Chamberlin, 1922, Proc. U. S. Nat. Mus., 61(10): 5.—Loomis, 1938, Bull. Mus. Comp. Zool., 82: 450.

Type specimen: Male, Mus. Comp. Zool., collected at Baracoa, Oriente Prov., Cuba, by W. O. Crosby.

Remarks: This form was separated from *duvernoyi* chiefly on the basis of color differences and less distinct segmental sulci. A perhaps more tangible difference obtains in the tarsal pads of males, said to extend

nearly to the last segments in *duvernoyi* but restricted to the anteriormost legs of *suprenans*. The difference in segment number (46-47 vs. 49-53) is not sufficiently documented by counts from series.

R. suprenans is apparently easily separated from *R. maximus* by the considerably greater segment number, 51-56, of the latter, as well as by details of the gonopods. The other differences cited by Loomis (size, color, form of the collum) are probably not reliable, however. A previously unnoticed distinction lies in leg size: the legs extend beyond the body in *suprenans* but are not visible from above in *maximus*.

Loomis reported numerous specimens of *suprenans* collected by P. J. Darlington in three localities in Oriente Province, Cuba, to which the form may be restricted.

I have examined topotypes of the species in the U. S. National Museum collections.

Rhinocricus maximus maximus (Loomis), new status and new combination
Cubocricus maximus Loomis, 1933, Bull. Mus. Comp. Zool., 75: 358, Figs. 5, 6; 1938, *idem*, 82: 450.

Type specimen: Male, Mus. Comp. Zool., collected at Central Jaronu, Camaguey Prov., Cuba, by L. D. Christianson, June 1931.

Remarks: The trinomial combination is adopted here to put the typical population of *maximus* on an equivalent standing with the "variety" *bartschi* of Loomis, probably a valid subspecies.

Loomis (1938) has discussed variation in a series of specimens taken in the Cubitas Forest, also in Camaguey Province. These two records suggest that perhaps the Cuban species of *Rhinocricus* are geographically vicarious, with *suprenans* occurring in the mountains of Oriente, *maximus maximus* in the central lowlands, *maximus bartschi* on the Isle of Pines, and *duvernoyi* in Pinar del Rio. Naturally, a large number of additional samples will have to be forthcoming before the status of these large millipeds can be worked out. In addition to the various characters cited (segment number, tarsal pads), an additional one may be mentioned for the attention of future workers: this is the shape and sculpture of the parietal sclerite which seems to be distinctive for each of the forms which I have examined (*parcus*, *suprenans*, and *m. bartschi*).

I have seen the long type series of *bartschi* collected on the Isle of Pines in April 1937 by Paul Bartsch, the form appearing to be only partially differentiated from the mainland population of *maximus*.

Rhinocricus maximus bartschi (Loomis), new combination

Cubocricus maximus bartschi Loomis, 1938, Bull. Mus. Comp. Zool., 82: 451.

Type specimen: Male, U. S. Nat. Mus. Myriapod Type No. 2364, collected in the Sierra de Casas, Isle of Pines, Cuba, by Paul Bartsch, 14 April 1937.

Loomis has discussed the characters and variation of this subspecies in the original description. The segment count is rather uniform, 50 to

53, but the length of adult specimens varies from 95 to 165 mm, a remarkable range!

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EXPLANATION OF FIGURES

Figs. 1-4. *Rhinocricus parvus* Karsch, specimen from Aguirre, Puerto Rico, all figures to same scale. 1. Anterior aspect of coleopods; 2. Posterior aspect of coleopods; 3. Posterior aspect of right phallopod; 4. Scobinae of 10th segment, the posterior edge of segment 9 pulled forward slightly.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NOTES ON A SMALL COLLECTION OF LIPARID
FISHES FROM THE YELLOW SEA

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Through the courtesy of Mr. Merrill Newman, I have had at my disposal several liparid fishes collected by him in May of 1953 on the west coast of Korea. The specimens herein reported were trawled at a depth of five to eight fathoms off Chodo Island, approximately 38° 30' N. latitude, 124° 15' E. longitude. The material has been deposited in the Natural History Museum of Stanford University.

The purposes of this paper are four: 1. Describe an apparently unknown form. 2. Give a second record of *Liparis choanus* and extend its known range to the eastern shores of the Yellow Sea. 3. Describe the only known male of *L. choanus*. 4. Confirm the observations of Abe (1950, 1955) that some species of *Liparis* lack posterior nostrils.

Counts on vertebrae, dorsal fin rays and anal fin rays have been taken from X-rays.

***Liparis newmani* new species**

Holotype: S.U. 53270, 55.6 mm in standard length.

Diagnosis: A *Liparis* with two nostrils, the dorsal and anal connected to the caudal, the dorsal lacking a notch, the pectoral with a notch, the gill slit extending down in front of seven pectoral rays and with a greater number of pectoral rays than dorsal rays.

Counts and measurements: Measurements in millimeters first, followed by percent of standard length in parentheses. Greatest body depth 12.4 (21.4); width of body at level of anal fin origin 6.5 (8.9); greatest head width 14.5 (25.0); head length 16.6 (28.6); eye 2.8 (4.8); snout length 7.0 (12.1); disc length 6.5 (8.6); disc width 5.0 (9.0); interorbital 7.9 (14.2); gill slit 4.8 (7.2); posterior edge of disc to vent 6.4 (11.5); snout to posterior tip of pectoral fin 27.0 (48.6); dorsal 42; anal 35; pectoral 46,

counted on the right fin; vertebrae 45, not including urostyle; branchiostegals 6.

Description: A slender fish with the greatest body depth immediately behind the head, 4.5 in standard length. Body compressed, deeper than wide, even at the widest point behind the head. Viewed from above or below, body tadpole-shaped, broad anteriorly, strongly compressed behind the level of the anal fin origin. Skin smooth, lacking prickles.

Dorsal fin origin a short distance behind a vertical from the posterior edge of the opercle. Dorsal fin not notched. Dorsal and anal fins connected with the caudal fin to about the middle of the caudal fin length. Distance from vent to origin of anal fin 4.9 in head. Pectoral fin notched, fifteenth ray from the bottom at the apex of the notch. The disc is longer than it is broad. Caudal fin rounded.

The head is broader than it is deep in the opercular region. Viewed dorsally it curves to the broadly-rounded snout. Viewed laterally the tip of the snout is a blunt, almost vertical area. Eye relatively large, 5.9 in head, with a rounded pupil. Nostrils paired, the anterior tubular, the posterior a raised pore. The distance between the two nostrils is equal to the vertical diameter of the eye. The posterior nostril is in line with a vertical from the anterior margin of the eye.

Premaxillary with six to eight oblique rows of tricuspid teeth which are progressively larger towards the posterior margin of the bone. Dentary with about six oblique rows of tricuspid teeth arranged as in the upper jaw. Each pharyngeal carries a broad pad of pointed teeth which oppose smaller but similar pads in the floor of the mouth. The gill rakers are modified into small dentigerous knobs. Gill opening moderate, 3.5 in head, extending down to level of seventh pectoral ray.

Body and head reddish-brown, skin fairly transparent, with many small, brown chromatophores. Pigment cells unevenly distributed on dorsal and anal fins giving them a variegated appearance. Two narrow, irregular, brown bands across the basal half of the caudal. Ventral part of fish in front of anal fin a uniform reddish-brown, lacking spots. Pectorals with a few scattered chromatophores, more thickly distributed dorsally.

Relationships: This species is apparently most closely related to *L. agassizi* of northern Japan, to which it keys out in Burke's (1930: 56) key to the genus. It differs most strikingly from *L. agassizi*, and indeed from any other known *Liparis*, in its high pectoral ray count, 46 in *L. newmani* compared to 32 to 42 in *L. agassizi* (based on counts by the author on 22 specimens in the U. S. National Museum). Another difference is in the color: Burke (1930: 77) gives four types of coloration, none of which is similar to *L. newmani*. Finally, the skin of *L. newmani* is more transparent than the skin of any specimens of *L. agassizi* I have examined.

Liparis multiradiatus is similar in its high fin ray counts, unnotched dorsal, notched pectoral and attached dorsal and anal fins but has more dorsal rays than pectoral rays, a larger eye (7.0 percent of standard length), a larger gill slit (9.8 percent of standard length) and other differences (see Matsubara and Iwai, 1954: 437).

I have also considered the possibility that my specimen may represent a young example of *Liparis tanakae*, a species which has been recorded from Chefoo on the Yellow Sea (Wu and Wang, 1933). In writing of Japanese and Korean material, Burke (1930: 87) states: "Pectoral fin unnotched in the adult, possibly slightly notched in the young." The pectoral of *L. newmani* is definitely notched. Some differences from Wu and Wang's description of Yellow Sea *L. tanakae* are a longer head (3.4 in standard length for *newmani*, 3.7 to 4.3 for *tanakae*), shorter snout (4.2 in head for *newmani*, 2.3 to 2.9 for *tanakae*), and larger eye (5.9 in head for *newmani*, 7.0 to 9.5 for *tanakae*). Unfortunately, the smallest specimen which they report is 180 millimeters in total length, so that differences in proportions may not be significant. Other differences are in coloration, Wu and Wang state immature fishes are grey; and in pectoral ray counts, they state 40 to 42. In addition, their figure shows a specimen with a much blunter head than in *L. newmani*.

Liparis choanus Wu and Wang

Liparis choanus Wu and Wang, 1933, p. 83, Figs. 5 and 6 (orig. descr., two spec. Chefoo, two spec. Tsingtau).

Study material: A male, 90.2 mm in standard length; a female, 85.0 mm in standard length.

Counts and measurements: Measurements in percent of standard length, given for the male first followed by the female in parentheses. Greatest body depth 24.8 (21.1); width of body at level of anal fin origin 9.4 (8.5); greatest head width 24.3 (24.9); head length 24.4 (27.1); eye 4.2 (3.6); snout length 8.3 (8.2); disc length 8.6 (9.4); disc width 8.3 (9.4); interorbital 9.5 (9.4); gill slit 8.3 (7.8); posterior edge of disc to vent 6.1 (9.0); tip of snout to posterior tip of pectoral fin 39.6 (41.9); dorsal 37 (35); anal 31 (30); pectoral 37-35 (37-37); vertebrae 39 (40), not including urostyle; branchiostegals 6.

Sexual dimorphism: The most striking difference between the two sexes is the presence of typical, *Liparis*, thumb-tack prickles on the male. They are abundant over the sides of the body and on the vertical fins, sparse and small on the upper lobe of the pectoral fin, and absent on the body median to the pectorals and on the venter. The dorsal region of the fish from the interorbital area to the anterior part of the dorsal fin has only scattered prickles but bears a profusion of small fleshy protuberances which give the entire area a rugose appearance. The female has smooth skin.

The male has proportionally longer dorsal and anal fin rays than does the female.

The male has a proportionally shorter disc to anus distance than does the female.

Both sexes have a small papilla behind the vent; however, that of the male is slightly larger and has the tip directed posteriorly. The papilla of the female is surrounded by a number of irregular folds which are absent in the male.

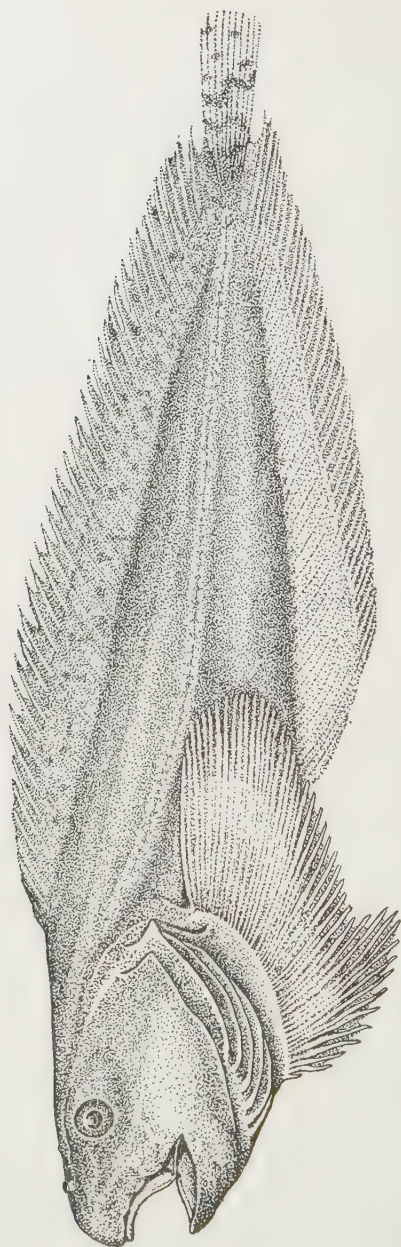


FIG. 1

The specimens at hand agree with the color pattern described for the type material and shown in the figure, with the exception that my material is reddish-brown rather than silvery. Wu and Wang (1933: 81) also describe *Liparis chefuensis*, a species which is reddish and has prickles but in most other respects seems similar to *L. choanus*. *L. chefuensis* was described from five specimens ranging from 120 to 155 mm total length, sex not given; *L. choanus* from four females, 92 to 110 mm total length. I refer my two specimens to *L. choanus* chiefly on the basis of greater similarities in proportions; however, it may well be that *L. choanus*, as described by Wu and Wang, is based on smaller females of *L. chefuensis*.

Nostrils: Many authors who have dealt with the genera of liparid fishes have utilized the presence of two pairs of nostrils to characterize the genus *Liparis*, although Burke (1930: 43) notes the posterior nostril is reduced in some species. More recently, Abe (1950, 1955) has described species which appear to be typical *Liparis* but lack posterior nostrils. A similar situation exists in *L. choanus*. The anterior nostril is present as a prominent, raised tube. The posterior nostril is present only as a very small, fleshy bump which has no opening. In their short diagnosis of the genus *Liparis*, Wu and Wang (1933: 80) state "Nostrils 2." However, in their descriptions of both *L. chefuensis* and *L. choanus* they mention only the tubular nostril.

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EXPLANATION OF FIGURE

Fig. 1. Holotype of *Liparis newmani*, 55.6 mm in standard length. Drawn by Mildred H. Carrington.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW WHITE-FOOTED MOUSE (*PEROMYSCUS*
LEUCOPUS) FROM SOUTHEASTERN VIRGINIA

BY JOHN L. PARADISO

Bureau of Sport Fisheries and Wildlife

Two slightly differentiated subspecies of *Peromyscus leucopus* have been described from the mainland of the eastern United States. Osgood (North Amer. Fauna, 28:115, 1909) has pointed out that extreme examples of the more southern form, *Peromyscus leucopus leucopus*, are to be found in southern Louisiana, while the more northern race, *Peromyscus leucopus noveboracensis*, is best characterized in central New England. The type localities for both these forms are in intermediate areas: Mouth of the Ohio River in Kentucky for *P. l. leucopus*, and New York for *P. l. noveboracensis*. These subspecies are distinguished largely by coloration. Along the southern Virginia coast, and probably into North Carolina, a previously unrecognized subspecies occurs which differs markedly from all other mainland forms of the eastern United States in both size and coloration. It may be known as:

***Peromyscus leucopus easti*, new subspecies**

Holotype: U. S. National Museum No. 302764; adult ♂, skin and skull; collected 10 April 1956, by Charles O. Handley, Jr., original No. 3052, in myrtle shrubbery in the flats back of the dunes on the barrier beach, 6.8 miles SE Pungo, Princess Anne County, Virginia.

This subspecies is named for Charles S. East, exhibits preparator at the U. S. National Museum, who collected white-footed mice at Virginia Beach in the summer of 1928.

Distribution: Taken in eastern Princess Anne County, Virginia, at Virginia Beach; 5 mi. S Virginia Beach; and 6.8 mi. SE Pungo. Probably occurs from the region of Cape Henry, Virginia, south along the barrier beach to Oregon Inlet, North Carolina, in favorable habitat.

Diagnosis: Similar to *Peromyscus leucopus leucopus* and *Peromyscus leucopus noveboracensis* but differs from both these forms as follows: Much smaller size, both externally and cranially; greater interorbital

breadth; longer interparietal; bony palate relatively longer in proportion to greatest length of skull; basilar length relatively shorter; cheek teeth relatively larger; braincase shorter, higher and more rounded; wings of pterygoids less expanded laterally; zygomatic arch presenting a more rounded aspect when viewed dorsally; zygomatic arch shorter in proportion to greatest length of skull; entire skull more delicately built.

In all pelages the coloration of *Peromyscus l. easti* differs from that of *Peromyscus l. leucopus* in being much paler, and in having a brighter, reddish wash on the flanks. *Peromyscus l. easti* is similar to *P. l. noveboracensis*, but has a reddish rather than a yellowish wash on the flanks.

Measurements: Ten adults of *P. l. easti* from 6.8 mi. SE Pungo, and from Virginia Beach, Princess Anne County, Virginia, measure as follows (averages followed by extremes): Total length 152.4 mm (145–162); tail 68.6 (62–75); hind foot 19.0 (18–20); ear 17.6 (17–18); greatest length of skull 24.7 (23.9–25.6); basilar length 19.0 (18.3–19.6); zygomatic width 13.0 (12.6–13.3); interorbital constriction 4.1 (3.9–4.3); interparietal length 8.5 (7.2–9.4); length of nasals 9.6 (9.1–10.5); length of bony palate 4.0 (3.7–4.2); anterior palatine foramina 4.8 (4.7–5.0); diastema 6.6 (6.4–6.9); postpalatal length 8.9 (8.6–9.2); maxillary tooth-row 3.5 (3.4–3.6); height of braincase 9.1 (8.8–9.4).

The two series which have been combined in the above measurements show no significant differences from each other.

Comparative measurements: The following measurements are given as an aid in comparing *Peromyscus leucopus leucopus* and *P. l. noveboracensis* with *P. l. easti*.

Seven adult specimens of *P. l. leucopus* from Houma, Louisiana, measure as follows: Total length 171.6 mm (162–180); tail 78.7 (74–83); hind foot 20.9 (20–22); greatest length of skull 26.3 (25.9–26.7); basilar length 19.8 (19.6–20.0); zygomatic width 13.5 (13.2–14.2); interorbital constriction 4.0 (3.8–4.1); interparietal length 8.4 (8.0–8.9); length of nasals 10.0 (9.5–10.4); length of bony palate 4.0 (3.9–4.2); anterior palatine foramina 5.1 (4.9–5.5); diastema 6.8 (6.5–6.9); postpalatal length 9.2 (8.9–9.6); length of maxillary toothrow 3.6 (3.4–3.9); height of braincase 8.9 (8.1–9.3).

Nine adult specimens of *P. l. noveboracensis* from Lake George, New York, measure as follows: Total length 175.0 mm (170–186); tail 80.9 (75–88); hind foot 20.7 (20–21); greatest length of skull 26.2 (25.6–26.9); basilar length 19.9 (19.3–21.7); zygomatic width 13.3 (12.8–13.7); interorbital constriction 3.9 (3.7–4.1); interparietal length 8.2 (7.4–8.9); nasals 9.9 (9.5–10.6); length of bony palate 4.0 (3.8–4.2); anterior palatine foramina 5.0 (4.8–5.3); diastema 7.1 (6.9–7.5); postpalatal length 9.3 (8.9–10.0); maxillary toothrow 3.5 (3.4–3.7); height of braincase 9.1 (8.8–9.6).

Remarks: *Peromyscus leucopus leucopus* occurs at nearby inland localities such as Dismal Swamp, Suffolk and Hampton, Virginia, and at Manteo and Currituck, North Carolina. Large series taken on Assateague Island, Accomack County, Virginia, and on the southern portion of the Delmarva

Peninsula, are also most like typical *leucopus*. Hence, *P. l. easti* has a small range. Within this range it is apparently confined to the marshes and sandy flats back of the beach dunes. Although its range is thus restricted, its very distinctive characters warrant its subspecific recognition.

Specimens examined: (All in collections at U. S. National Museum) 18, from Princess Anne Co., Virginia, as follows: Virginia Beach, 10; 5 mi. S Virginia Beach, 2; 6.8 mi. SE Pungo, 6.

Comparative material: (All in collections at U. S. National Museum) KENTUCKY—Eubank, 29. LOUISIANA—Houma, 17; LaFayette, 2; Mer Rouge, 4; Morgan City, 8; Tallulah, 5. NEW HAMPSHIRE—Ossipee, 32. NEW YORK—Hastings, 2; Lake George, 29; Locust Grove, 9; Newburgh, 2; Owego, 5; Sing Sing, 2. NORTH CAROLINA—Asheville, 2; Catalooche Ranch, 2; Chapanoke, 2; Currituck, 4; Highlands, 1; Manteo, 2; Old Richmond, 1; Pisgah National Forest, 13; Raleigh, 36. VIRGINIA—Amelia, 10; Assateague Island, 29; Belle Haven, 1; Chincoteague Island, 12; Dismal Swamp, 48; near Hampton, 9; Kinsale, 15; Old Point Comfort, 3; near Wattsville, 35.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

SPEOSTRIARIA, NEW GENUS (DIPLOPODA:
CHORDEUMIDA: CHORDEUMIDEA: STRIARIIDAE)

BY NELL B. CAUSEY
Fayetteville, Arkansas

Samwel Cave, Shasta County, California, is the only known locality of the striariid milliped that is the type of the genus described here. An unusual series of both Pleistocene and Recent specimens of it has been collected by the Cave Research Associates. The original description of *shastae* was based on female and larval specimens, and the species was tentatively included in the genus *Striaria*. The males that have been collected recently show that the species is unusual not only in the large body size, but also in the extent of the sexual dimorphism.

The female holotype and male allotype are in the American Museum of Natural History. Topotypes of both sexes are in the collections of the California Academy of Sciences, San Francisco, and of the author.

I am grateful to the Cave Research Associates for the opportunity of studying the millipeds collected by them in California caves.

Genus *Speostriaria*, new genus

Diagnosis: Distinguished from *Striaria* by the simpler branching of the anterior gonopods and by the greater amount of sexual dimorphism, especially as seen in the collum.

Type species: *Striaria shastae* Causey, 1958.

Species: One.

Description: Crests equally spaced, low, becoming lower and the sixth one absent from posterior segments. Granules smaller and sparser on posterior segments. Females and larvae of both sexes with the collum (Fig. 2) small but hoodlike, with a bulge behind the anterior margin, and with paranota; second segment with paranota; legs and antennae longer and thinner than in epigeal genera. Secondary sexual characters of the male include the following: labral spines, short mandibular spines,

longer antennae and legs, longer collum without the median bulge and paranota, second segment without paranota, lower crests on the anterior segments, posterior subsegments of segments 2 through 5 or 6 longer, and legpairs 1 through 7 and 10 and posterior gonopods as in *Striaria*. Sternum of segment 7 bandlike. Anterior gonopods contiguous along the middle line; each gonopod consists of a short coxa, which bears a lateral coxite, and of a telopodite composed of an anterior branch, a posterior branch, and three flagella.

Speostriaria shastae (Causey)

Figs. 1-5

Striaria shastae Causey, 1958, Proc. Biol. Soc. Washington, 71: 182.

Description of male allotype: Length 25 mm, width 2.2 mm. Labral spines directed ventrad and slightly mesiad, their length about one fifth the width of the ventral margin of the labrum. Eyes composed of brown ocelli in 3 irregular series, 6 on one side and 7 on the other. Antennae slender, their length nearly twice the greatest body width, and the relative lengths of segments 1 through 7 as follows: 5:18:40:24:40:16:5. Head and first three segments as shown in Fig. 1. Segments 2, 3, and 4 each with pleural lobes, those of segments 2 and 3 broader and shorter than those of segment 4. Caudal margins of tergites 4, 5, and 6 rise to a slight peak in the midline; the crests of those segments are oblique.

Coxae of the first legpair enlarged and contiguous, their ventral surfaces covered with long setae. Coxae of the second legpair also enlarged and contiguous; the gonopores, which open from the coxae, with a thin membrane around the margin and an adjacent tuft of long setae; second segments produced into a stout, anteriorly directed lobe with a tuft of long setae at the apex; third segments enlarged distad as in the third legpair. Coxae of third legpair enlarged and contiguous as in species of *Striaria*; the coxae are elongated, narrowed at the apex, curved forward, and the telopodite is attached at about the middle of the lateral surface. Legpairs 4 through 7 have the coxae enlarged, rectangular, and almost contiguous; segments 3 and 4 are broadened and flattened slightly. Legpair 10 has the opening of the coxal gland near the base. The posterior legs are slender and longer, the longest ones about one and one half times the greatest body width, and the relative lengths of segments 1 through 7 as follows: 9:2:17:38:6:6:41. The setae on the legs are sparser and relatively shorter than in species of *Striaria*. Somatic characters not described here are as described for the female.

In situ the anterior gonopods project ventro-caudad and the telopodites of the posterior gonopods are laterad to them. From a lateral view, the three large divisions of the anterior gonopod can be seen: the anterior and posterior branches of the telopodite and, between them, the shorter, soft, lobelike coxite. The heavily chitinized anterior branch ends in three unequal divisions, of which all can be seen from an anterior view (Fig. 3). The posterior branch ends in two large divisions, of which only one can be seen from the posterior view (Fig. 4). From a mesial view (Fig. 5),

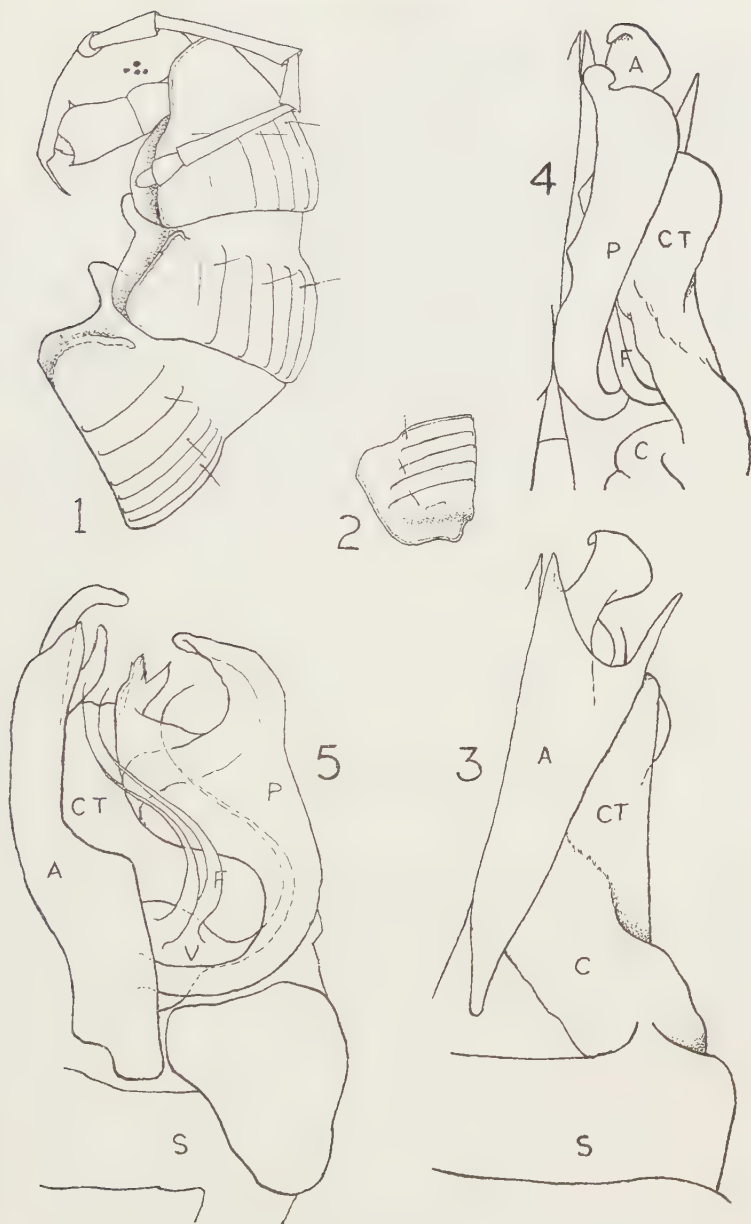


FIG. 1-5

the entire posterior branch and the three flagella, which arise from a vesicle at the base of the telopodite, are visible.

The posterior gonopods are very much as in species of *Striaria*. The sternum and coxae are transparent, flattened, and thin, and the flat but thicker and ventrally setose telopodites are almost perpendicular to them. The joints between the three parts are distinct.

Remarks: Except for the brown ocelli, living specimens are nearly white. The number of ocelli in 15 adult specimens ranges from 8 in 3 series to 4 in 2 series. This is as many ocelli as most epigeal striariids have. The segmental setae are longer than in epigeal species, but the sensory setae on the legs are not. The elongation of the legs and antennae may have been induced by cave life, for in all epigeal species of the family they are relatively shorter and thicker. I have never seen *Striaria eldora* Chamberlin, 1953, which is known only from caves in Eldora and Calaveras counties, California, but probably it is a troglophile. The description refers to its antennae as being of "moderate length, clavately thickened distad"; there is no statement as to the length of the legs. Possibly the large body size of *Speostriaria shastae* is a cave-induced modification. A slight increase in body size is very common among cave forms of the family Conotylidae. *Collections:* Three males, 12 females, and several larvae have now been collected from Samwel Cave, most of them by Richard E. Graham. All collections were made either in June or in January, and mature specimens were taken in each of those months. They occur from the twilight zone to the lowest level of the cave under pieces of broken stone and organic matter. A recently found fossil (No. 1571, Cave Research Associates) was in a Pleistocene stratum with an antilocaprid, *Euceratherium* sp.

EXPLANATION OF FIGURES

Fig. 1.—*Speostriaria shastae*, head and first three segments (without the legs) of the male.

Fig. 2.—Collum of the female, left side.

Fig. 3.—Right anterior gonopod, anterior view.

Fig. 4.—Left anterior gonopod, posterior view.

Fig. 5.—Left anterior gonopod, mesial view.

A, anterior branch of telopodite. C, coxa. CT, coxite. F, flagellum. P, posterior branch of telopodite. S, sternum. V, vesicle.

Figs. 1 and 2 are drawn to the same scale. Figs. 3, 4, and 5 are drawn to a larger, but equal, scale.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW CARDINAL FISH OF THE GENUS *ARCHAMIA*
FROM NORTHERN AUSTRALIA

BY ERNEST A. LACHNER AND WILLIAM RALPH TAYLOR
U. S. National Museum

The study of the apogonid fishes collected by the Arnhem Land Expedition of 1948 revealed a species of *Archamia* Gill believed new to science. The expedition to Arnhem Land, Northern Territory, Australia, was conducted under the auspices of the Commonwealth of Australia, the National Geographic Society and the Smithsonian Institution. About 15,000 specimens representing many families of fishes were collected under the direction of Robert Rush Miller, Museum of Zoology, University of Michigan. A faunal report of these collections is in progress by William Ralph Taylor.

The morphological divergence among the species of *Archamia* was reviewed by Lachner (1951). A previously recognized polymorphic species, *Archamia lineolata* (Cuvier), was demonstrated to represent four distinct species. The new species is related to the *A. lineolata* complex. All members of the genus are marine and are found in the Indian and west-central Pacific Oceans.

The generic allocation of the new species is substantiated by the presence of the following characters: body slab-sided, comparatively deep; dentition complete, with small villiform teeth in a narrow band on the jaws and in single rows on the palatines and vomer; spinous dorsal with six spines; base of anal fin long, the number of rays ranging from II,16 to II,18.

***Archamia melasma* new species**

Archamia lineolata Paradise and Whitley, Mem. Queensland Mus., 9(1): 84, 1927 (species listed, Pellew Islands; material re-examined under Australian Mus. No. IA.1499).

Holotype: Australian Museum register No. IB.4473, a female specimen

60 mm in standard length taken on a coral reef with rotenone poison at Yirkalla, near Cape Arnhem, Arnhem Land, Northern Territory, Australia, on 11 August 1948 by Robert Rush Miller and Bill Harney, in water at a depth of about four feet.

Paratypes: USNM No. 173794, totaling 6 specimens, taken with the holotype and bearing the same data, one specimen a male 55 mm in standard length and 5 female specimens ranging from 55.5 mm to 59 mm in standard length; Australian Museum No. IA.1499, one specimen, 56.5 mm in standard length, taken in the Pellew Islands, Gulf of Carpentaria by W. E. J. Paradice in June, 1923.

Additional specimens examined: Australian Mus. No. IA.2334, 2 specimens, 56.5 and 60.5 mm in standard length, taken at North Barnard Island, Great Barrier Reef, Queensland by W. E. J. Paradice, 1924.

Diagnosis: *Archamia melasma* is most closely related to *A. biguttata* of the *lineolata* complex. It differs from *biguttata* in having the dark humeral spot descend downward over the operculum and in the absence of the large, intensely black, basi-caudal spot characteristic of *biguttata*. These closely related species of *Archamia* are compared in Table 1.

Description: This description is based on all of the specimens listed above. The methods of recording the counts and measurements are given by Lachner (1951:581). Counts of several meristic characters are given first for the holotype, followed by counts taken from the remaining specimens. Where the data for the holotype are identical with that of all the other specimens, but one number is given.

Dorsal fin rays VI-1,9(10 specimens); anal fin rays II,17, II,16(2), II,17(5), II,18(2); pectoral fin rays, counting the left and right sides, 14-14, 14-14(5), 13-14(1), 14-13(1), 14-15(1); pelvic fin rays I,5 (10); branched caudal fin rays 8,7(10); scale rows along the lateral line about 24 in holotype, 22(1), 23(3), 24(2), 25(1); scale rows above lateral line 2 in the holotype, 2(6); scale rows below lateral line about 7 in holotype, 7(7), 8(2); gill rakers including all rudiments 21, 21(1), 22(3), 23(5). There were either 1 or 2 rudiments and 4 well-developed rakers on the upper arch, one developed raker at the angle of the arch, and 15 or 16 developed rakers and an occasional rudiment on the lower arch.

The vertebral count, including the fused urostylar vertebrae as one, was 24 in all specimens.

Measurements expressed in thousandths of the standard length are given for the holotype and two paratypes in Table 2.

Body compressed and deep; mouth terminal; eyes large (Table 2); posterior margin of preopercle serrated, particularly the lower margin; anterior margin of preopercle smooth; angle of jaw nearly reaches vertical drawn through middle of eye; first spine of spiny dorsal fin small; second spine equal to or slightly smaller than third; third spine of spiny dorsal fin about one and one-fourth times greater than diameter of eye; anal spines comparatively stout, the first spine short, only one-fifth length of second spine; second anal spine slightly longer than diameter of eye;

TABLE 1.—Comparison of closely related species of *Archamia*

SPECIES	ANAL FIN RAYS	BASE-CAUDAL SPOT	HUMERAL SPOT	DUSKY SPOT ON BODY JUST POSTERIOR TO OPERCULUM AND BELOW LATERAL LINE
<i>A. lineolata</i> (Cuvier)	II,13 to II,15 (49 specimens)	Usually well-developed, blackish and about equal to size of pupil	Absent	Absent
<i>A. fucata</i> (Cantor)	II,15 to II,18 (58 specimens)	Diffuse, dusky and large, notably larger than pupil	Absent	Absent
<i>A. dispilus</i> Lachner	II,16 to II,18 (13 specimens)	Diffuse, faint, somewhat larger than pupil	Absent	Diffuse, dusky spot present, deeper than wide
<i>A. biguttata</i> Lachner	II,16 to II,17 (22 specimens)	Intense black, nearly circular, slightly larger than pupil	Intensely black, circular to squarish, at junction of gill opening and body	Absent
<i>A. melasma</i> , n. sp.	II,16 to II,18 (10 specimens)	Absent	Blackish, vertically elongate, extending downward on opercular flap from junction of gill opening and body	Absent

TABLE 2.—Measurements of *Archamia melasma*, expressed in thousandths of the standard length.

CHARACTER	HOLOTYPE IB.4473 ♀	PARATYPES USNM 173794	
		♀	♂
Standard length, mm	60	56	55
Body depth at origin of spinous dorsal fin	428	446	424
Body width at mid-body just behind opercular flap	138	148	131
Head length	397	407	398
Head depth at occiput	400	368	355
Length of caudal peduncle	175	179	178
Least depth of caudal peduncle	153	155	144
Length of longest pectoral ray	323	325	304
Length of second spine of spinous dorsal fin ..	—	180	129
Diameter of eye	137	137	142
Length of upper jaw	183	193	193
Length of snout	87	93	80
Least width of bony interorbital	98	104	102
Tip of snout to origin of spinous dorsal fin	438	445	431
Tip of snout to origin of anal fin	602	589	575
Tip of snout to insertion of pectoral fin	358	368	373
Tip of snout to insertion of pelvic fin	383	377	384

scales ctenoid with about 7 to 18 radii in the anterior field; lateral line complete and located rather high on body (see Fig.); gill rakers on first arch long, slender and simple, longest raker about one-half diameter of eye; contour of outer margin of soft dorsal fin slightly rounded; outer margin of anal fin slightly falcate; caudal fin emarginate or weakly forked; pelvic fins extend posteriorly slightly beyond origin of anal fin; inner rays of pelvic fin weakly united to body by thin membrane.

Teeth on both jaws, the vomer and palatines; those on lower jaw are short, conical and in several irregular rows anteriorly, tapering to 1 or 2 rows posteriorly; teeth on upper jaw short and pointed and in several irregular rows anteriorly and in a wider, villiform band posteriorly; the palatines and vomer have a single row of small, pointed teeth.

Color in Alcohol: The characteristic markings in both sexes are: The conspicuous, black humeral spot or bar that descends downward over the posterior margin of the opercle, and the wide, blackish, oblique bar below the eye (see Fig.). The humeral spot is intensely developed in all specimens. As the pigmentation descends over the margin of the opercle it becomes less intense. The two specimens from North Barnard Island, Great Barrier Reef, Queensland, have the weakest markings on the opercular margin.

The body coloration, otherwise, is pale and the fins transparent. The

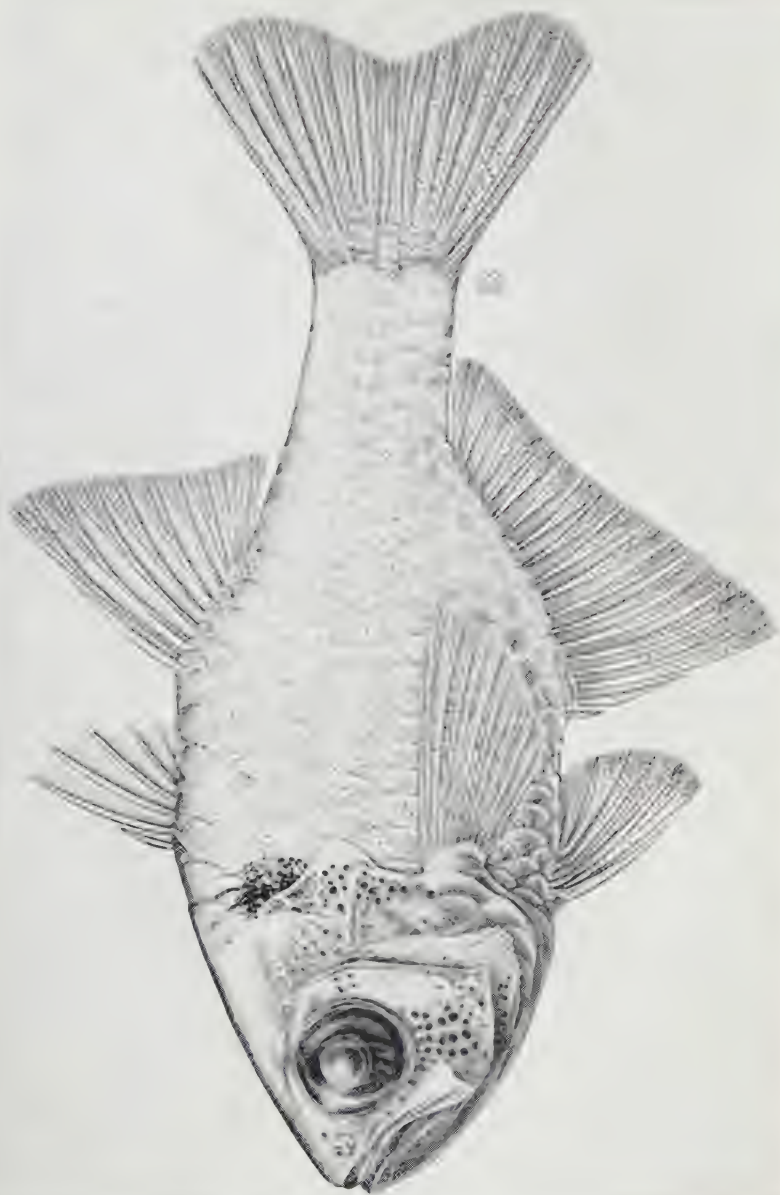


FIG. 1

top of the head, chin and snout have some scattered, brownish pigmentation and a few tiny melanophores are located near the base of the caudal fin in some specimens.

Color in life: The following notes describing the living coloration of this species were recorded in the field by Robert Rush Miller; a colored sketch accompanied the field notes: body silvery white with about 23 very narrow downward and forward curving vertical lines of deep red-orange; a black scapular bar; a yellow-orange band from snout to eye passing through eye; all fins pale pink; dark brown bar extending obliquely backward from below eye to edge of preopercle.

Geographic distribution: We do not expect this species to range extensively in the Indo-Pacific fauna. It may represent another endemic, characteristic of the Australian faunal area. Our rich collections, particularly the extensive material collected by the Albatross Philippine Expeditions from the Philippine and East Indies Islands and from many other Pacific areas, did not contain this species. The senior writer also examined the large collections housed in several European museums during 1956 while on a John Simon Guggenheim Fellowship, and did not find this form. Among the noteworthy collections examined were those at the Rijksmuseum van Natuurlijke Historie, Leiden, and the Zoological Museum, Amsterdam, Netherlands.

Remarks: This species was named *melasma* in reference to the black humeral spot.

We express our appreciation to J. W. Evans, Director, and Gilbert P. Whitley, Curator of Fishes, The Australian Museum, Sydney, Australia, for the loan of critical material and for providing information of Australian fishes; and to Mrs. C. B. Lutz, staff artist, U. S. National Museum, for her meticulous drawing.

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EXPLANATION OF FIGURE

A female paratype of *Archamia melasma*, 56 mm in standard length, taken over a coral reef at Yirkalla, near Cape Arnhem, Arnhem Land, Northern Territory, Australia on 11 August 1948 by Robert Rush Miller and Bill Harney. Drawing by Mrs. C. B. Lutz, staff artist, U. S. National Museum.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW SUBSPECIES OF POCKET GOPHER
(*THOMOMYS UMBRINUS*) FROM SINALOA, MEXICO,
WITH COMMENTS ON *T. U. SINALOAE* AND
T. U. EVEXUS

BY E. RAYMOND HALL AND CHARLES A. LONG

Although only one species of pocket gopher is thought to occur in Sinaloa, the geographic distribution of the species is incompletely known and it is, therefore, not surprising to find an unnamed subspecies, which may be named and described as follows:

***Thomomys umbrinus varus*, new subspecies**

Type: Male, adult, skin and skull; No. 75271, K.U.; 1 mi. S El Dorado, Sinaloa, México; 14 November 1957; obtained by William L. Cutter, original No. 1452.

Range: Known only from the type locality.

Diagnosis: Size large (see measurements); Ochraceous-Tawny (Capitalized color terms after Ridgway, "Color Standards and Color Nomenclature," Washington, D. C., 1912) but darkened with blackish below ears and in mid-dorsal area from nose to rump; tympanic bullae rugose and only slightly inflated; sagittal crest (11.7 mm long) prominent; maxillary arms of zygomata inclined posteriorly; nasals V-shaped posteriorly, flaring anteriorly but otherwise straight-sided; interpterygoid space V-shaped.

Comparisons: Indistinguishable in color from topotypes (for example 75264 Univ. Michigan) of *Thomomys umbrinus camoae* but larger in all measurements taken except interorbital breadth, which is the same, and lesser extension, posterior to nasals, of premaxillae. In comparison with the darker *Thomomys umbrinus sinaloae*, next north along the Pacific Coast, there is an equal or even greater disparity in size. From both *camoae* and *sinaloae*, the skull of the male of *varus* further differs as follows: tympanic bullae smaller; maxillary arm of zygoma inclined posterolaterally (less nearly at a right angle with longitudinal axis of skull); squamosal root of zygoma inclined anterolaterally (less nearly at a right angle). Differences from *Thomomys umbrinus parviceps* of higher terrain to the eastward, *Thomomys umbrinus musculus* to the southward, and *Thomomys umbrinus atrovarius* of the coastal area, also to the southward, are even greater. By weight each of those three subspecies appears to be

hardly half so large as *varus*, is Plumbeous to black instead of Ochraceous-Tawny, and has a skull that relative to the over-all length is wider across the braincase and has zygomatic arches that are widest posteriorly instead of anteriorly. Because of the larger degree of difference between *varus* and the three, small, dark subspecies (*parviceps*, *musculus*, and *atrovarius*) it is difficult to imagine intergradation between *varus* and any one of them. The uninflated tympanic bullae of *varus*, nevertheless, are seen also in *musculus* and *atrovarius*.

Measurements of the holotype (in millimeters): Total length 281; length of tail 101; length of hind foot 37; basilar length 41.9; length of nasals 18.0; zygomatic breadth 31.0; mastoidal breadth 23.3; breadth of rostrum 10.0; interorbital constriction 6.7; alveolar length of maxillary tooth-row 9.6; extension of premaxillae posterior to nasals 2.0; length of rostrum (middle of anterior border of nasals to lateral junction of maxilla with hamular process of lacrimal) 20.1.

Specimen examined: One, the holotype.

Thomomys umbrinus sinaloae Merriam

Three females (67609–67611 K.U.) from along the Río Fuerte, 1 mi. N, ½ mi. E San Miguel, Sinaloa, are larger, darker, and differ in other respects from *Thomomys umbrinus simulus*, the subspecies to the eastward, and more closely resemble *Thomomys umbrinus sinaloae* to the southward and *Thomomys umbrinus camoae* to the northward. Comparisons with the adult females of *camoae* from Guaymas, Sonora, and with three adult female topotypes of *sinaloae* reveal intermediacy in the ratio of the width of the nasals to the width of rostrum. The specimens closely resemble *camoae* in total length (230 mm, in *camoae* 228, and in *sinaloae* 214) and in relative shortness of tail that is 47 per cent of the length of the head and body (46 per cent in *camoae* and 51 per cent in *sinaloae*). The specimens more closely resemble *sinaloae* in broad rostrum (8.2, in *sinaloae* 8.4, and in *camoae* 7.6), long rostrum (15.7, in *sinaloae* 15.9, and in *camoae* 15.0), and coloration (darker than *camoae*). The specimens (67609–67611 K.U.) extend the known geographic range of *T. u. sinaloae* 110 miles northward along the coast from Altata, Sinaloa, the type locality of *T. u. sinaloae*. Previously the subspecies *T. u. sinaloae* was recorded only from the type locality.

Thomomys umbrinus evexus Nelson and Goldman

This subspecies until now has been known from only the holotype from Mount San Gabriel, 7,000–9,000 feet, state of Durango. Two males and two females (66132–66135 K.U.) from Villa Ocampo, 4,575 feet elevation, Durango, only 10 miles southeast of the mentioned type locality, agree with the holotype as originally described and differ from *T. u. sheldoni* (6 specimens from 7 mi. SW Las Adjuntas, and 6 specimens from 10 mi. SW El Salto, both localities in the state of Durango) the geographic range of which bounds that of *evexus* on the north, west and south. The black-tipped hairs of the russet-colored upper parts and the brownish

proximal portion of the white-tipped tail of *evexus* are well shown in our specimens from Villa Ocampo.

Acknowledgments: Grants from the Watkins Fund of the Kansas University Endowment Association furthered the field work that yielded the specimens on which the above report was based, and a grant from the National Science Foundation furthered the study, in the Museum, of the specimens. We are grateful to W. H. Burt and E. T. Hooper of the Museum of Zoology of the University of Michigan, and S. P. Young, R. H. Manville, and Viola S. Shantz of the Biological Surveys Collections of the U. S. Fish and Wildlife Service for lending certain specimens essential for comparison.

PROCEEDINGS
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TWO NEW SPECIES OF *CRASPEDORRHYNCHUS*
(MALLOPHAGA) FROM NORTH AMERICA

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Species of the Ischnoceran genus *Craspedorrhynchus* Keler, 1938, are found in North America on avian hosts of the family Accipitridae (Hawks, Eagles and Kites). To date, no species have been recorded from hosts of the other families of Falconiformes. Species of this genus are of the short, round-bodied, robust type with a large head, and are found on the neck and head of the host. The premarginal carina and the ventral carina of the forehead are prolonged to a point well beyond the anterior margin of the dorsal anterior plate. This character and the distinctive male genitalia separate the genus from related genera found on other hosts.

The known North American species form a rather homogeneous taxon. Differences in the male genitalia do not appear to be great. The characters which appear to offer the best means of separation are: size, shape of the dorsal anterior plate of the forehead, chaetotaxy, and the sternal plate of the genital region. In some species, the chaetotaxy of abdominal segments II-VII (the first apparent segment is II) is not the same in both sexes. Individual differences of chaetotaxy within each species are slight. The sternal plate of the genital region of the male is more variable in shape than is the dorsal anterior plate of the forehead.

Two new species are herewith described and illustrated from material in the collection of the U. S. National Museum. In addition, keys are provided to the species known to occur in North America.

***Craspedorrhynchus subhaematopus*, new species**

Holotype male: Dorsal anterior plate of forehead as shown in Fig. 8.

Terminal abdominal segments as shown in Fig. 6. Male genitalia as shown in Fig. 7. Distinctive chaetotaxy as given in the key to the males.

Allotype female: Dorsal anterior plate of forehead as in the male. General shape as in the male, but larger and more robust. Distinctive chaetotaxy as given in the key to females. Terminal abdominal segments as shown in Fig. 5.

Measurements: Holotype male and allotype female measurements in millimeters, are respectively: length of head 0.76, 0.86; breadth of head 0.73, 0.79; breadth of prothorax 0.45, 0.49; breadth of pterothorax 0.60, 0.69; breadth of abdomen 0.92, 1.12; total length 1.98, 2.27.

Type host: *Accipiter cooperii* (Bonaparte), Cooper's Hawk.

Type material: Holotype male and allotype female, U. S. National Museum Catalog No. 64,938, collected at Laurel, Maryland, on 20 April 1938 by E. B. Marshall. Two paratypes collected in Leon County, Florida, on 2 December 1925 by H. L. Stoddard. Ten paratypes collected at Tillamook, Oregon, on 1 January 1931 by Alexander Walker.

Discussion: This species is closest to *C. haematopus* (Scopoli, 1763). In addition to the differences given in the keys, the two species can be separated by the differences illustrated in Figs. 1-8.

***Craspedorrhynchus americanus*, new species**

Holotype male: Dorsal anterior plate of forehead as shown in Fig. 13. Genital sternal plate as shown in Fig. 9. Genitalia as shown in Fig. 17. Distinctive chaetotaxy as given in the key to the males.

Allotype female: Dorsal anterior plate of forehead as in the male. General shape as in the male, but larger and more robust. Distinctive chaetotaxy as given in the key to the females. Shape of genital sternal plate as in *C. haematopus* (Scopoli, 1763).

Measurements: Holotype male and allotype female measurements, in millimeters, are respectively: Length of head 0.87, 0.93; breadth of head 0.79, 0.85; breadth of prothorax 0.47, 0.51; breadth of pterothorax 0.66, 0.71; breadth of abdomen 1.08, 1.31; total length 2.12, 2.60.

Type host: *Buteo jamaicensis* (Gmelin), Red-tailed Hawk.

Type material: Holotype male, allotype female, U. S. National Museum catalog No. 64,939, and sixteen paratypes collected at Rosedale, Mississippi, on 3 March 1952 by M. G. Vaiden. Five paratypes collected at Cedar Grove, Wisconsin, on 12 May 1956 by D. Berger. One paratype collected at Tooele, Utah, on 13 August 1951. One paratype collected in Pennsylvania, in November, 1931 by M. Wood. Five paratypes collected at Winchester, New Hampshire, on 25 September 1933 by L. R. Nelson. Two paratypes collected at West Point, New York, 30 October 1926 by W. Robinson. Two paratypes collected at Stag Lake, New Jersey, in 1926.

Discussion: This species is close to *C. buteonis* (Packard, 1870), *C. dilatatus* (Rudow, 1869), and *C. hirsutus* Carriker, 1956; the other species found on the host genus *Buteo*. In addition to differences given in the

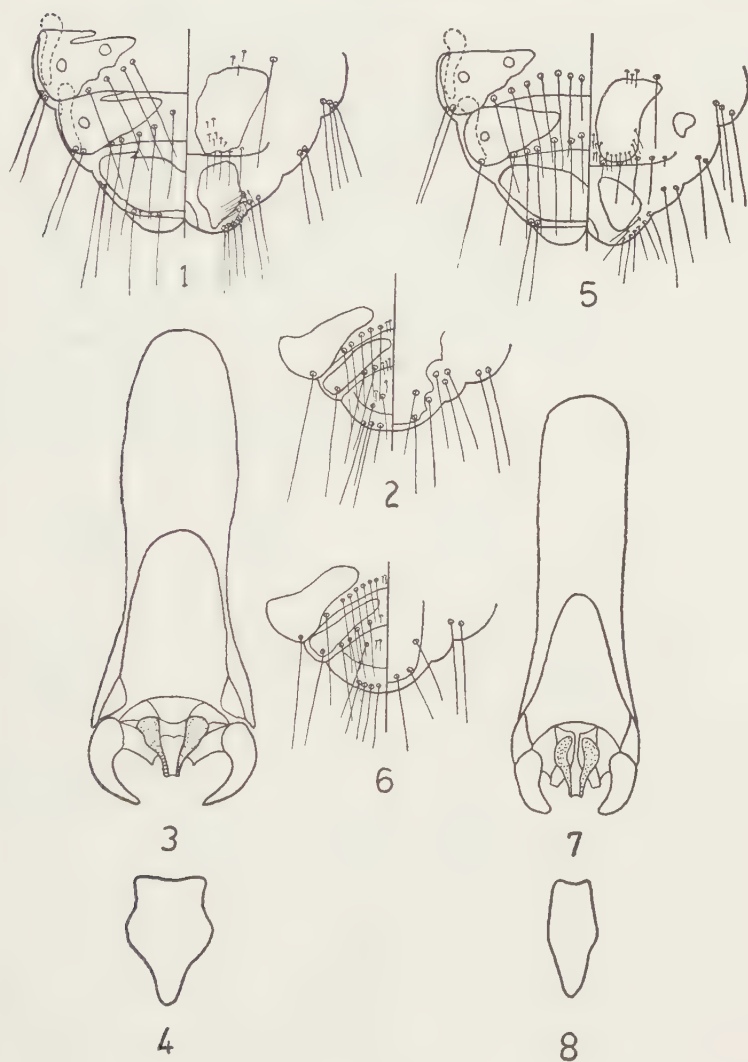


FIG. 1-8

keys, these closely related species can be separated by the differences illustrated in Figs. 9-16.

Key to females of North American species of *Craspedorrhynchus*

1. Posterior margin of pterothorax with 20 long setae *haematopus*
- Posterior margin of pterothorax with 14 long setae 2

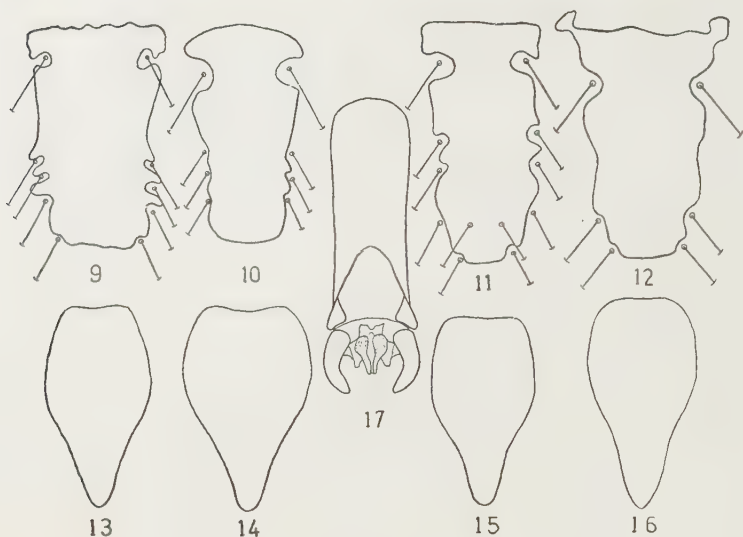


FIG. 9-16

- Posterior margin of pterothorax with 12 long setae 3
Posterior margin of pterothorax with 10 long setae *hirsutus*
2. Pleural plates of abdominal segment VII each with 10
long setae *obscurus*
Pleural plates of abdominal segment VII each with 6
long setae *subhaematopus*
3. Posterior margin of vulva with 14 medium-length setae *halieti*
Posterior margin of vulva with 12 medium-length setae *aquilinus*
Posterior margin of vulva with 10 medium-length setae 4
4. Posterior margin of tergite VIII with 14 long setae *americanus*
Posterior margin of tergite VIII with 12 long setae 5
5. Posterior central margin of abdominal sternite III with 14
long setae *dilatatus*
Posterior central margin of abdominal sternite III with 20
long setae *buteonis*

Key to males of North American species of *Craspedorrhynchus*

1. Posterior margin of pterothorax with 16 or more long
setae *haematopus*
Posterior margin of pterothorax with 14 or fewer long setae 2
2. Abdominal sternite VI with a sparse row of setae 3
Abdominal sternite VI with numerous scattered setae *obscurus*
3. Abdominal tergite II with more than 14 long setae 4
Abdominal tergite II with fewer than 14 long setae 5
4. Abdominal tergite VIII with 8 long setae *americanus*

Abdominal tergite VIII with 10 long setae	<i>halieti</i>
5. Thoracic sternal plate between coxae II and III with two long setae	6
Thoracic sternal plate between coxae II and III with four long setae	7
6. Pleural plates of abdominal segment IV each with at least 7 long setae	<i>subhaematopus</i>
Pleural plates of abdominal segment IV each with no more than 4 long setae	<i>aquilinus</i>
7. Genital sternal plate with 3 long setae on each side in lateral indentations	<i>hirsutus</i>
Genital sternal plate with 4 long setae on each side in lateral indentations	<i>dilatatus</i>
Genital sternal plate with 5 long setae on each side in lateral indentations	8
8. Genital sternal plate with median setae	<i>buteonis</i>
Genital sternal plate without median setae	<i>americanus</i>

Host list for North American species of *Craspedorrhynchus*

- C. americanus* n. sp.—*Buteo jamaicensis* (Gmelin), Red-tailed Hawk.
C. aquilinus (Denny, 1842)—*Aquila chrysaetos* (Linnaeus), Golden Eagle.
C. buteonis (Packard, 1870)—*Buteo lineatus* (Gmelin), Red-shouldered Hawk.
C. dilatatus (Rudow, 1869)—*Buteo lagopus* (Pontoppidan), Rough-legged Hawk.
C. haematopus (Scopoli, 1763)—*Accipiter gentilis* (Linnaeus), Goshawk.
C. halieti (Osborn, 1896)—*Haliaeetus leucocephalus* (Linnaeus), Bald Eagle.
C. hirsutus Carriker, 1956—*Buteo regalis* (Gray), Ferruginous Hawk.
C. obscurus (Giebel, 1874)—*Rostrhamus sociabilis* (Vieillot), Everglade Kite.
C. subhaematopus n. sp.—*Accipiter cooperii* (Bonaparte), Cooper's Hawk.

EXPLANATION OF FIGURES

Figs. 1–4 are of *C. haematopus* (Scopoli, 1763). 1, dorsal-ventral view of terminal abdominal segments, female; 2, dorsal-ventral view of terminal abdominal segments, male; 3, male genitalia; 4, dorsal anterior plate of forehead, male.

Figs. 5–8 are of *C. subhaematopus* n. sp. 5, dorsal-ventral view of terminal abdominal segments, female; 6, dorsal-ventral view of terminal abdominal segments, male; 7, male genitalia; 8, dorsal anterior plate of forehead, male.

Figs. 1, 2, 4, 5, 6, and 8 are drawn to the same scale.

Figs. 9–12 are genital sternal plate of *Craspedorrhynchus* sp., male. 9, *C. americanus* n. sp.; 10, *C. dilatatus* (Rudow, 1869); 11, *C. buteonis* (Packard, 1870); 12, *C. hirsutus* Carriker, 1956.

Figs. 13-16 are dorsal anterior plate of forehead of *Craspedorrhynchus* sp., male. 13, *C. americanus* n. sp.; 14, *C. dilatatus* (Rudow, 1869); 15, *C. buteonis* (Packard, 1870); 16, *C. hirsutus* Carriker, 1956.

Fig. 17 is of *Craspedorrhynchus americanus* n. sp., male genitalia.

Figs. 3, 7, and 9-17 are drawn to the same scale.

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PROCEEDINGS
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THE LARGE TOADS OF CUBA

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The genus *Bufo* is represented in Cuba by five forms. The largest of the Cuban toads is *Bufo peltacephalus* Tschudi, which has an islandwide distribution. Under two National Science Foundation grants, collections of this large species have been made on the Isla de Pinos as well as in all the provinces of Cuba, and adequate material has now accumulated to make possible an assessment of the variation in the characteristics of the various populations involved. Over the years, my companions have aided me greatly in collecting these large amphibians, but I wish to mention especially the aid afforded me by Ronald F. Klinikowski, Peter F. Pepe, Barton L. Smith and James R. Talada in taking specimens of the new form from the northern coast of Oriente. The illustrations of dorsal views are the work of David C. Leber and the drawings of the heads are by Peter F. Pepe; both merit my gratitude for their work. I have borrowed material from the U. S. National Museum (USNM), the Museum of Comparative Zoology (MCZ) and the Illinois Natural History Survey (INHS). I wish to thank Doris M. Cochran, Ernest E. Williams and Philip W. Smith for their hearty cooperation in the current study.

Bufo peltacephalus was described by Tschudi (1838: 52) as *Bufo peltoccephalus*, a toad whose coloration was brownish red with a pattern of hieroglyphs. Such a thumbnail description leaves much to be desired as far as allocating this name to one of the two populations of the large Cuban toad. Although it was considered likely that the original material came from the vicinity of the La Habana, use of the term "hieroglyphs" to describe the diffuse and blotched pattern of the Habana population is not tenable. Strictly speaking, I would not call the



FIG. 1-4

markings of the central Cuban toads hieroglyphs, but at least this population shows definite markings on a reddish-brown dorsum (see Figs. 1 and 2). I feel that it is more appropriate to restrict the name *B. p. peltacephalus* to these distinctly marked toads which occur from Las Villas Province eastward throughout Oriente; with the description of a new subspecies of this amphibian, restriction of the type locality may well be

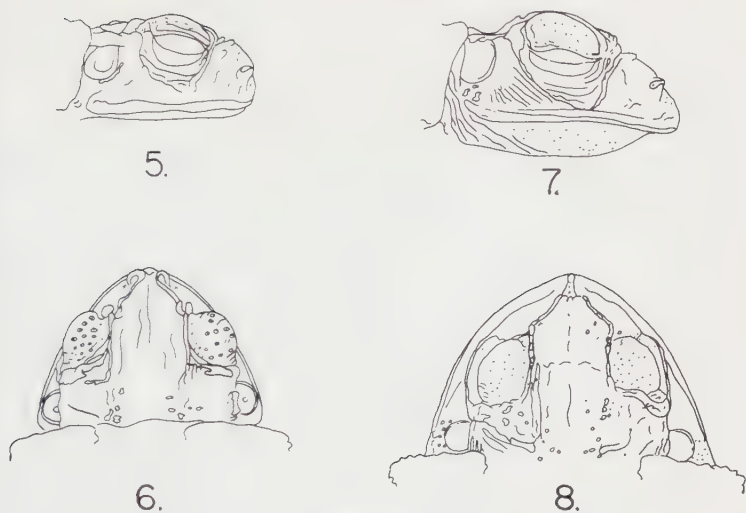


FIG. 5-8

in order. Considering the fact that it is probable that Tschudi's material came from the region of some seaport, and La Habana being disqualified for reasons specified above, I hereby propose to restrict the type locality of *Bufo peltacephalus peltacephalus* Tschudi to the vicinity of Santiago de Cuba, Oriente Province, Cuba.

The large toads of western Cuba are thus without a name, and for these western populations I hereby propose the name:

***Bufo peltacephalus fustiger* new subspecies**

Type: American Museum of Natural History (AMNH) 59847, from San Vicente, Pinar del Río Province, Cuba, taken 21 December 1956, by John R. Feick. Original No. 1205.

Paratypes (all from Pinar del Río Province, Cuba): AMNH 63383, 3.5 km NE Guane, 26 August 1958, G. R. Zug; AMNH 63384, Cueva de Santo Tomás, 10 km N Cabezas, 1 September 1958, A. Schwartz; AMNH 61196-97, San Vicente, 29 August 1957, J. R. Feick; USNM 27330-32, El Guamá, 18-25 March 1900, William Palmer and J. H. Riley; USNM 27634, San Diego de los Baños, 17 April 1900, William Palmer and J. H. Riley.

Distribution: Known from the Península de Guanahacabibes (Vallecito de San Juan) throughout Pinar del Río, Habana and Matanzas provinces at least to the vicinity of the city of Matanzas.

Diagnosis: A subspecies of *Bufo peltacephalus* characterized by a dif-

fuse dorsal pattern of yellows, tans and browns, usually appearing as vermiculations or confluent ill-defined blotches, large size (males up to 148 mm, females up to 164 mm in snout-vent length) and a long and broad head.

Description of type: An adult male, with the following measurements (in millimeters): snout-vent length, 126.6; length of head from snout to posterior border of tympanum, 40.3; greatest width of head, 52.8; longitudinal diameter of eye, 15.2; naris to eye, 11.1; femur, 46.3; tibia, 44.2; fourth toe, 45.8; interorbital distance, 20.4; "length" of parotoid gland, 24.3.

The coloration of the type is a combination of dark chocolate-brown markings laterally which become slightly more reddish centrally, and irregular areas of tan, these areas not being sharply set off from the dark pattern. The entire dorsum gives the appearance of dark and light vermiculations, arranged asymmetrically (see Fig. 3). There is a rather distinct, brown, longitudinal band, beginning just posterior to the tympanum and extending along the side to the region of the groin, where it becomes fragmented into a series of distinct brown spots. The fore- and hindlimbs are banded; the antebrachium, thigh, crus and pes each appear to have two bands. None of these limb markings is especially definite or prominent. The dorsal surface of the head is uniformly brown. The ventral surface is dull gray on the throat and chest, with the chin and lip areas cream. The belly becomes increasingly pale posteriorly after the gray chest, but remains somewhat clouded with gray to the region of the groin. The anterior and posterior faces of the thighs are mottled with brown blotches on a lighter tan background, the blotches on the anterior face of the thigh being smaller than those on the posterior.

The head is like that of *Bufo p. peltacephalus* in that the cranial crests are low, and not projecting, and there is an anteorbital notch at the junction of the supraorbital and canthal cranial crests (see Figs. 5 and 6). The upper lip does not project into a flange-like shelf, and the cranial crests and surface of head itself are smooth and lack any keratinized tubercles or spines. Although the dorsum is tuberculate, the warts on the anterior third being the largest, there are no keratinized spines either dorsally or ventrally, and the tubercles are low and rounded.

The toes are rather short and webbed, 4-3-5-2-1 in order of decreasing length. The web between toes 3 and 4 is the largest, and allows three phalanges of digit 4 and two of digit 3 to remain free, although it extends as a marginal lateral flange to the tips of these digits. The basal phalanx of digit 4 lacks web but shows the dermal flange for about half its length. The fingers are moderate in length and slender, unwebbed, 3-4-1-2 in order of decreasing length. The tympanum is large and conspicuous, eccentrically oval in shape, and separated from the posterior corner of the eye by a distance one-half its longitudinal diameter. The interorbital space is smooth, with three tubercles posteriorly. Microscopically, the interorbital space is raised into fine rugae, rather than tubercles.

Variation: Six adult males have the following measurements: Snout-

vent length 129.5 (115.6–147.8); head length 42.2 (39.0–47.7); head width 55.2 (50.5–62.3); longitudinal diameter of eye 14.9 (14.1–15.4); naris to eye 11.7 (9.5–12.7); femur 45.0 (41.1–50.5); tibia 44.8 (43.2–46.0); fourth toe 45.2 (41.6–48.3); interorbital distance 21.0 (18.8–23.5); “length” of parotoid 24.1 (23.0–26.1). Nine adult females measure: Snout–vent length 139.8 (125.5–163.8); head length 45.5 (41.5–50.4); head width 59.8 (55.6–64.2); longitudinal diameter of eye 15.5 (13.7–17.5); naris to eye 12.2 (10.6–13.0); femur 48.9 (38.8–56.0); tibia 48.6 (41.7–52.3); fourth toe 46.7 (41.8–50.6); interorbital distance 22.3 (19.7–24.2); “length” of parotoid 25.9 (22.8–28.8). Females average larger in all measurements taken than males.

Comparison of the 14 adult specimens with the type shows some variation. Although the dorsal pattern is always diffusely vermiculate, it is often more narrowly so than the pattern of the type; thus, the dorsum may show a very diffuse pattern of tan to yellow, diffuse, worm-like markings on a darker tan to chocolate-brown background. In no specimen is the dorsal pattern clearly defined as it is in *B. p. peltacephalus* (see Figs. 1 and 2). Structurally, the series resembles the type in most ways; the dorsal and ventral tubercles may or may not be spinose. If the latter condition pertains, the spines are poorly developed and not striking. The anterior tubercles are always larger and more prominent than the posterior ones. The interorbital area is always smooth with fine rugae, with a few scattered bony tubercles posteriorly. Because of the broad head, this member often appears to be unusually large, even for such a big toad. All specimens show the prominent anteorbital notch.

Comparisons: *B. p. fustiger* differs from the nominate form in that *peltacephalus* has a dorsal pattern of distinct yellow vermiculations on a chocolate to reddish-brown background (see Figs. 1 and 2). The diffuse pattern of *fustiger* contrasts with the definite pattern of *peltacephalus*. The western subspecies appears to reach a larger size than *peltacephalus*, males of which race are known to reach a size of 128 and females 139 mm. The difference in head width is reflected in the ratio of head width to snout–vent length; this ratio ($\times 100$) in male *fustiger* is 42.7 (40.6–44.4) and in male *peltacephalus* 40.5 (38.3–45.5), in female *fustiger* 42.9 (38.1–45.5) and in female *peltacephalus* 39.7 (37.2–40.8).

Remarks: I have seen no specimens intermediate between the two subspecies of *B. peltacephalus*; the easternmost specimen of *fustiger* is from Matanzas, Matanzas Province, and the westernmost *peltacephalus* is from Soledad, Las Villas Province; thus a distance of some 170 kilometers separates the known ranges of these two forms. Intergrades are to be expected in western Las Villas and eastern Matanzas provinces.

With the naming of an additional race of *B. peltacephalus* from Cuba, I am undecided about the status of the Isla de Pinos toads. I have examined 16 adult toads from four Isla de Pinos localities, including both north and south coasts. Chromatically, these anurans are closest to *B. p. peltacephalus*, but occasional specimens resemble the western *B. p. fustiger*. In size, they are intermediate between the two Cuban races; males reach

a maximum size of 142 and females 149 mm. In contrast to *fustiger*, these toads are more narrow headed and are thus closer to *peltacephalus*. In addition, they appear to be more warty dorsally than either of the Cuban races. Although I feel that the relationship of the Isla de Pinos fauna is with that of western Cuba, it appears that these toads are an exceptional case, and I prefer to call them *Bufo p. peltacephalus*, thus showing their affinities with the central and eastern Cuban subspecies. The differences mentioned above should be noted, however.

Bufo p. fustiger occupies the same niche in western Cuba that *B. p. peltacephalus* does elsewhere on the island. These toads occur, at times abundantly, in hardwood forest, cultivated fields, along stream banks, and in almost any mesic situation. They are not uncommon along the ocean in certain areas. Males vocalize from flooded ditches and slowly running streams, usually after heavy rains in summer, and are very shy, ceasing to call when disturbed.

The measurement "length" of parotoid gland requires comment. Since the parotoids are lateral in position and are curved both dorsally and ventrally, it is difficult to secure an accurate measurement of length. Actually, this measurement is almost one of thickness of the amphibian in the neck region, and thus can be used only with extreme reservation as far as differentiating various forms of the *B. peltacephalus* group is concerned.

Specimens examined (other than type and paratypes): *B. p. fustiger*, PINAR DEL RÍO PROVINCE—Vallecito de San Juan, 11 km W Cayuco, 1 (AMNH 63382); La Mulata, 2 (USNM 51864-65); Guanajay, 1 (USNM 27333); 3 km NE Guanajay, 1 (AMNH 59843); MATANZAS PROVINCE—6 mi. E Canasí, 1 (AMNH 63379); Matanzas, 1 (USNM 57892). Also numerous juveniles and subadults from Pinar del Río and Habana provinces.

Bufo p. peltacephalus, LAS VILLAS PROVINCE—Soledad, nr. Cienfuegos, 5 (AMNH 6020, 61185-88); CAMAGÜEY PROVINCE—3 mi. S Playa Santa Lucía, 2 (AMNH 63473); 2 km SE Banao, 1 (AMNH 61194); ORIENTE PROVINCE—Banes 2 (USNM 138901, 138903); El Cobre, 1 (AMNH 494); Santiago de Cuba, 3 (AMNH 495, USNM 57893-94); 0.7 mi SW El Cristo, 1 (AMNH 63474); 5 mi S Dos Caminos, 5 (AMNH 63475); Guantánamo, 1 (USNM 81807); 12 mi E Guantánamo, 1 (AMNH 63481); Taco Bay 1 (AMNH 63482); Pilón, 1 (AMNH 32209); ISLA DE PINOS—just W Nueva Gerona, east base Sierra de las Casas, 7 (AMNH 63380); Bibijagua, 1 (AMNH 61199); Paso de Piedras, ca. 20 km SSW Santa Fé, 5 (AMNH 61200, 61203-06); Jacksonville, 3 (AMNH 63381). Also additional juveniles and subadults from Las Villas, Camagüey, and Oriente provinces, as well as the Isla de Pinos.

In the summer of 1959, Messrs. Klinikowski and Smith, and myself collected a small series of distinctly patterned toads on El Yunque de Baracoa. In addition to their characteristic design, these toads were structurally distinct from *B. peltacephalus*, although obviously closely related to it. The two forms appear to be generally sympatric, although ecologically separated. That this ecological isolation is not complete is shown by two

specimens which I regard as hybrids between the two. The new species and *B. peltacephalus* I regard as another example of the rapidly increasing number of recognized sibling species in the West Indies, and for this form I propose the name, in honor of James R. Talada for his enthusiastic assistance in many ways in the field, as

***Bufo taladai*, new species**

Type: AMNH 63485, from 2 mi S Taco Bay (Bahía de Taco), Oriente Province, Cuba, taken 23 December 1959, by Albert Schwartz. Original number 8598.

Paratypes (all from Oriente Province, Cuba): AMNH 63484, Taco Bay, 22 December 1959, P. F. Pepe; AMNH 63486–87, same date as type; AMNH 63490–93, 3 mi S Taco Bay, 25 December 1959, P. F. Pepe and Albert Schwartz; AMNH 63476–79, west slope, El Yunque de Baracoa, 7 August 1959, R. F. Klinikowski, A. Schwartz, B. L. Smith.

Distribution: Known from the north coast of Oriente (vicinity of Baracoa) west to northern Camagüey (vicinity of Banao).

Diagnosis: A moderately large species of *Bufo* (largest male 138, largest female 147), related to *Bufo peltacephalus* but differing from that species in having a dorsal pattern of dark brown with light yellow ocellate spots; lacking an anteorbital notch at the junction of the supraorbital and canthal cranial crests, all cranial crests beaded with minute keratinized granules; a distinctly flanged upper jaw; and more spinose than *B. peltacephalus*, especially on the anterior dorsal surface, parotoid glands, dorsal surface of the arms, and throat and chest.

Description of the type: An adult female, with the following measurements: Snout–vent length 141.8; length of head from snout to posterior border of tympanum 49.0; greatest width of head 59.3; longitudinal diameter of eye 17.2; naris to eye 12.6; femur 48.4; tibia 47.2; fourth toe 49.8; interorbital distance 23.1; “length” of parotoid gland 23.1.

The coloration of the type is uniformly chocolate-brown dorsally, mottled with a profusion of light yellow, generally rounded, spots, which are somewhat dusky (tan) along the midline of the back (see Fig. 4). The femoral markings are like those of the dorsum, and the concealed surfaces of the thighs are brown with a pattern of yellow spots and vermiculations. There are apparently three brown crural crossbars, and the dorsal surface of the pes is mottled brown and yellow. The toes, as well as the fingers, are tan to cream colored. The forelimbs are likewise mottled brown and yellow, with three poorly delineated antebrachial crossbars. The entire head is brown without chromatic features. The ventral surface is dirty cream on the belly to a very pale tan on the chest and throat. The palmar and plantar tubercles are prominent but not keratinized.

Structurally, the type is characterized by the high and prominent cranial crests (see Figs. 7 and 8) and the absence of an anteorbital notch between the supraorbital and canthal crests. Immediately anterior to the eye, the junction of these two crests is somewhat raised, and then the canthal crest descends rather abruptly to the naris. The parietal area of

the head is irregularly rugose, and the region between the tympanum and the upper labial margin, as well as the loreal area, shows irregular small keratinized tubercles. The upper jaw projects laterally and anteriorly into a sort of shelf or flange, along the surfaces and edge of which are studded a series of tiny but conspicuous horny tubercles, which occur as well along the margin of the mouth itself. The postorbital, supraorbital, preorbital, canthal, and rostral crests likewise are beaded with these small horny tubercles, and the profile of the head is distinctly sharp-nosed rather than with the blunt appearance of *peltacephalus* (see Fig. 5). The upper eyelids are also spinose.

On the body, the dorsal tubercles are distinctly horny, the keratinizations larger and more conspicuous anteriorly than posteriorly, and giving the appearance of a tuberculate and spinose cape over the back between the parotoids. All warts on the fore- and hindlimbs have horny spines. The throat and chest are spinose, the black spines prominent against the pale tan to gray ground color. Posterior to the chest, the spines become smaller and less conspicuous, and they disappear completely about half way across the belly.

The toes are relatively long and webbed, 4-3-5-2-1 in order of decreasing length. The web between toes 3 and 4 is the largest, and allows three phalanges of digit 4 and two of digit 3 to remain free, although it extends as a marginal lateral flange almost to the tips of these digits. The fingers are long and slender, 3-4-2-1 in order of decreasing length, unwebbed. The tympanum is large and conspicuous, irregularly oval in shape, and separated from the posterior corner of the eye by a distance one and one-half times its longitudinal diameter. The interorbital area is smooth throughout most of its length, but there are a few irregular rugosities posteriorly; microscopic examination of the interorbital fossa shows that it is paved with tiny tubercles, giving it a shagreened appearance.

Variation: Seven adult males have the following measurements: snout-vent length 117.8 (99.8-138.4); head length 38.6 (31.0-45.2); head width 45.1 (30.0-53.6); diameter of eye 13.9 (10.8-15.7); naris to eye 10.5 (7.3-12.6); femur 41.2 (36.0-51.5); interorbital distance 18.5 (14.4-22.0); "length" parotoid 20.9 (18.2-24.7). Seven adult females, including the type, have the following measurements: snout-vent length 138.4 (118.5-146.9); head length 45.0 (37.8-49.0); head width 55.5 (47.8-59.3); diameter of eye 15.5 (13.3-17.2); naris to eye 12.0 (10.7-12.8); femur 47.4 (36.9-54.7); tibia 46.4 (38.4-48.3); fourth toe 47.0 (40.5-50.0); interorbital distance 22.5 (18.5-24.4); "length" parotoid 24.7 (20.4-29.1). Inspection of these data shows that females average larger in all measurements taken. Mature males may have a heavily cornified area on the entire dorsal surface of the thumb, but some of the larger males lack this keratinized pad.

Comparison with the type of the 13 specimens regarded as mature shows that they agree very well with it in coloration and pattern. The dorsal color is always some shade of brown, usually dark, with the back profusely covered with pale yellow to cream spots. The precise configuration

and arrangement of these spots varies; some individuals (AMNH 63493) are almost irregularly verruculate, whereas others (AMNH 63476) have relatively few small discrete spots, and much more dark ground color than pale on the dorsum. In some the parotoids are distinctly yellowish in preservative, but this is not usual. The crural bands are at times almost completely obliterated by random and diffuse pale mottling and spotting.

All the adult specimens are like the type insofar as wartiness, absence of the anteorbital notch, pointed snout and flanged upper jaw are concerned. One individual (AMNH 63480) is unique in that the supra-orbital crest almost overhangs the eye anteriorly. The ventral spines may be more or less prominent than on the type; if more, they extend over the entire belly, and if less, they involve the throat and chest only.

There are eight juvenile and subadult specimens ranging in snout-vent length from 23.7 to 97.6 mm. The largest of these resembles the adults in pattern; the next largest (96.0 in snout-vent) is considerably lighter dorsally, and the dorsum is more or less diffusely verruculate. The remaining six toads, of which the largest is 59.6 mm, show the juvenile pattern of a dark brown interocular triangle, its apex pointed posteriorly, and two pairs of dark brown dorsal blotches, the posterior pair somewhat less clearly defined than the anterior. The ground color of these small toads was dull tan in life, and none showed the vivid emerald green or rich reddish-tan of young *B. peltacephalus*.

All juveniles lack the anteorbital notch; the larger three toads in addition have the beaded cranial crests and heavily spinose back and face of the adults. It is apparent that the characteristics of *taladai* are not the manifestations of age or senility.

Comparisons: *B. taladai* hardly needs comparison with the three species of smaller toads (*B. longinasus*, *B. gundlachi* and *B. cataulaciceps*) of Cuba, nor with the somewhat larger *B. empusus*. The new species exceeds the former three greatly in size, and is distinctly larger than *empusus*, which species reaches a maximum body length of 74 mm (Ruibal, 1959: 14).

From *B. peltacephalus*, *taladai* differs in lacking the anteorbital notch, and in having a pattern of light spots on an otherwise dark dorsum. The new species is far more spinose than *peltacephalus*, and the head appears to be more pointed (*i.e.*, longer and narrower). Attempts at proving such a difference in head shape statistically show no significant difference, but at least male *taladai* have the average head width/snout-vent length ratio lower (39.1) than do male *peltacephalus* (40.1 Isla de Pinos, 42.7 western Cuba, 40.5 eastern Cuba). Female *taladai* have this ratio similar to *B. p. fustiger*. In size, *taladai* reaches a smaller size than Isla de Pinos and western Cuba *peltacephalus*, but is larger than the eastern race. I am unable to differentiate the two species involved on the basis of any measurements or proportions.

Comparison of juvenile *peltacephalus* and *taladai* shows that even the smallest *peltacephalus* have a clearly defined anteorbital notch, whereas the smallest *taladai* lack it. The cranial crests of the small *peltacephalus*

are irregularly edged, whereas those of *taladai* are smoother. The patterns of both are comparable, although I have had the impression that the interocular triangle is narrower and more restricted in *peltacephalus* and larger and wider in *taladai*. Juvenile *peltacephalus* only 48.5 mm in snout-vent length are already losing the juvenile pattern and have the first indication of the adult pattern, whereas a juvenile *taladai* 59.6 mm in snout-vent length still retains the juvenile pattern. There may thus be a difference between the two forms concerning size at which the juveniles begin to change to the adult pattern.

Remarks: Two specimens deserve special comment; these are AMNH 63488 from the type locality, and USNM 138902, from Banes, Oriente. This latter specimen has been reported upon by Lynn (1957: 57). It is one of three specimens from Banes collected by Major Chapman Grant; the remaining two toads are typical of *p. peltacephalus*. Lynn commented that the one toad was not typical of *B. peltacephalus* in that it lacked the anteorbital notch; the dorsal pattern likewise appears to be rather diffuse and is neither like the ocellate *taladai* pattern nor the distinctly vermiculate *peltacephalus* pattern. It resembles the latter species in lacking beaded cranial crests, and being smoother dorsally and ventrally, without spinose tubercles. The toad from Taco Bay likewise lacks anteorbital notches, is not spinose dorsally, but has a spiny throat and chest, and was almost uniformly olive green in life with vague mottling and blotching in gray and brown dorsally. Both specimens have a rather intermediately flanged upper jaw.

I prefer to call these two bufonids hybrids between *taladai* and *peltacephalus*. Structurally, they are almost ideally intermediate between the two species. Although *taladai* is presently not known from the Banes area, it is to be expected there since it occurs farther to the west in Camagüey. Both *peltacephalus* and *taladai* are known from Taco Bay, and the possibility of hybridization is not untenable. It might be argued that these two specimens represent intergrades—rather than hybrids—between the two toads, and that *taladai* should be regarded as a race of *peltacephalus*. The random nature of the distribution of these two peculiar individuals, and the fact that both forms maintain their distinctness despite geographical, if not ecological, sympatry elsewhere convinces me that the relationship is a specific one.

All specimens of *B. taladai* were taken in cut-over rain forest. The El Yunque series was obtained on a road on the side of this mountain as the toads hopped about on the road and in adjacent banana and cacao groves; the series from Taco Bay was taken in similar situations. The single Taco Bay *peltacephalus*, on the other hand, was taken in coastal scrub growth near the shore of the ocean, and was not associated with rain forest.

Specimens examined other than paratypes: CAMAGÜEY, 2 km SE Banao, 2 (AMNH 61193, 61195); ORIENTE, Moa, 1 (INHS 9269); Mayarí, 1 (MCZ 3725); Taco Bay, 1 (AMNH 63482); 3 mi S Taco Bay, 3 (AMNH 63489, 63494–95); Baracoa, 1 (MCZ 22090).

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EXPLANATION OF FIGURES

Fig. 1.—*Bufo p. peltacephalus*, AMNH 63475, adult male, snout-vent length 123.9 mm, from 5 mi S Dos Caminos, Oriente Province, Cuba.

Fig. 2.—*Bufo p. peltacephalus*, AMNH 63481, adult female, snout-vent length 133.6 mm, from 12 mi E Guantánamo, Oriente Province, Cuba.

Fig. 3.—*Bufo p. fustiger*, new subspecies, AMNH 59847, type, adult male, snout-vent length 126.6 mm, from San Vicente, Pinar de Río Province, Cuba.

Fig. 4.—*Bufo taladai*, new species, AMNH 63485, type, adult female, snout-vent length 141.8 mm, from 2 mi S Taco Bay, Oriente Province, Cuba.

Fig. 5.—*Bufo p. peltacephalus*, lateral view of head, AMNH 63473, from 3 mi S Playa Santa Lucía, Camagüey Province, Cuba; note absence of flange-like upper lip.

Fig. 6.—*Bufo p. peltacephalus*, dorsal view of head, same individual as Fig. 5; note prominent anteorbital notch.

Fig. 7.—*Bufo taladai*, lateral view of head, same individual as Fig. 4; note flange-like upper lip.

Fig. 8.—*Bufo taladai*, dorsal view of head, same individual as Fig. 4; note absence of anteorbital notch.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

NEW SUBSPECIES OF PHILIPPINE BIRDS

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In connection with my current studies of the birds of central Luzon, I have reviewed the geographic variation of certain species in the Philippine archipelago as a whole. This has resulted in the discovery of several new subspecies, of which three are described here. For one of these, a race of the sunbird *Aethopyga shelleyi*, an old name is available. Specimens have been borrowed through the courtesy of the authorities of the American Museum of Natural History (AMNH), Chicago Natural History Museum (CNHM), U. S. National Museum (USNM), and Yale Peabody Museum (YPM). Luzon specimens of *Saxicola caprata* in Carnegie Museum (CM) were collected in connection with a project of the Graduate School of Public Health, University of Pittsburgh, under the sponsorship of the Commission on Viral Infections, Armed Forces Epidemiological Board, and supported in part by the Office of the Surgeon General, U. S. Department of the Army.

***Pitta sordida palawanensis*, new subspecies**

Type: Adult ♂, CM No. 100677, collected at Puerto Princesa, Palawan, Philippine Islands, by R. C. McGregor *et al.*, 10 August 1925.

Characters: Nearest *P. s. sordida* of the Philippine archipelago proper, but blue of rump and wing coverts of a richer, deeper cobalt color (deeper than in any other race of this widely distributed species); in *sordida* these areas are paler and greener, more of a turquoise color. The outer edges of the inner secondaries are bluer, less green, in *palawanensis*, although this can be matched in some specimens of *sordida*. The green of the dorsum of *palawanensis* can be seen, in series, to be lighter than that of *sordida*. This difference is not apparent on the underparts, which are subject to much individual variation in the amount of bluish wash over the green.

The odd plumage variation in which the green dorsal and ventral feathers are marked with black streaks is more common in *sordida* than in *palawanensis*. These markings, not known to be correlated with age or sex,

are present in 10 out of 25 (40%) of *sordida* examined, and in 3 out of 24 (12.5%) of *palawanensis*.

In addition to color differences described above, Palawan specimens have, on the average, longer bills than those of *sordida*.

Remarks: Three type specimens have been examined during this study; those of *Pitta atricapilla rothschildi* Parrot, *P. leucoptera* Elliot, and *P. persola* Brodkorb. The type of *rothschildi*, from Marinduque, is strikingly different from any other specimen of *Pitta sordida* examined in having a strong blue wash on the underparts. Other characters ascribed to it by Parrot are not apparent. A female from Marinduque, however, collected within three days of the type of *rothschildi*, is inseparable from a series of *sordida*, and I agree with Hartert (1922: 379) that *rothschildi* represents an extreme variant of *P. s. sordida*. The type of *leucoptera* is a very young juvenile without data. The blue feathers of the rump do not match those of Palawan birds in shade, so *leucoptera* need not be considered as a possible name for the Palawan race.

The type of *Pitta persola* Brodkorb, 1934, is in the Museum of Zoology of the University of Michigan, where I examined it on 16 April 1957. It is a specimen in very poor condition. The underparts are badly faded, and the abdomen may well have been as brilliantly red as in any *sordida* when fresh. There is no sign of any black in mid-abdomen, "*persola*" in this respect resembling CM No. 100845, an immature specimen of *sordida palawanensis*. There are, however, no other indications of immaturity about the type of *persola*, in spite of the conjectures of Hachisuka (1935: 423). The bill of this specimen, although broken, can be seen to be smaller than that of normal *P. s. sordida*, and thus much smaller than that of *P. s. palawanensis*. The nostril of *persola* was described as being "narrow and almost linear, instead of broad and oblique" as in the single specimen of "*sordida*" (= *palawanensis*) examined by Brodkorb. Actually the nostril is not unlike that of certain specimens of *sordida*; there is much variation in apparent shape of the nostrils depending on the way the operculum has dried, and on whether a thread was passed through the nostrils by the preparator (a deplorable but virtually universal practice). The supposed darker bill and feet of *persola* can be matched in series of *sordida*. The two characters in which *persola* departs completely from *P. s. sordida* and *P. s. palawanensis* are the green rather than black tail, and the complete absence of white on the primaries. As noted by Hachisuka (*loc. cit.*), these are characteristics of a southern group of subspecies of *Pitta sordida* from the Celebes, New Guinea, etc. This fact, together with the "make" of the skin itself, suggests that the type of *Pitta persola* was probably a native trade skin purchased by Steere in the market in Puerto Princesa. I cannot agree with Meise (1938: 158) in considering *persola* to be an aberrant specimen of the Palawan population of *Pitta sordida*; the name *persola* will probably find its way into the synonymy of one of the southern races of *Pitta sordida*, but it is certainly not applicable to the population here called *Pitta sordida palawanensis*.

Measurements (in millimeters): Bill from anterior edge of nostril:

P. s. sordida; 12.4, 13.1, 13.5, 13.5, 13.7, 13.8, 13.9, 14.1, 14.3, 14.4, 14.8, 14.8, 14.9, 14.9, 15.0, 15.1, 15.3. *P. s. palawanensis*; 14.5, 14.7, 15.2, 15.3, 15.3, 15.3, 15.7, 15.7, 16.3, 16.4, 16.4, 16.5, 16.6, 17.2, 17.6. Sexes are alike in size. There is no significant difference in wing length between *palawanensis* and *sordida* in general. Within *sordida*, two birds from Negros and one from Samar are rather short-winged (95, 101, and 97 mm as compared with 101–107 mm for Luzon birds), and the Samar specimen has the smallest bill of any Philippine example measured (12.4 mm). It is doubtful, however, whether any further subdivision of *sordida* is either practical or desirable.

Specimens examined (adults only): *P. s. palawanensis*: PALAWAN—23; BALABAC—1. *P. s. sordida*: LUZON—8; MARINDUQUE—2 (including type of *rothschildi*); MINDORO—1; NEGROS—2; CEBU—1; SIKUIJOR—1; SAMAR—1; MINDANAO—1; BASILAN—4; JOLO—3; TAWI-TAWI—1. Also types of *Pitta leucoptera* and *P. persola*, and specimens in AMNH of all recognized races of *P. sordida*.

***Saxicola caprata randi*, new subspecies**

Type: Female, AMNH No. 459839, collected at Bondo, Siaton, Negros, Philippine Islands, by D. S. Rabor, 30 January 1954 (collector's No. 5931).

Characters: Females differ from *S. c. caprata* of Luzon as follows: much blacker above; throat paler, more grayish or whitish rather than cinnamon-buff; underparts with heavy black shaft-streaks, accentuated in worn plumage; thighs distinctly spotted rather than faintly spotted or immaculate; under tail coverts averaging paler buff, contrasting more with color of lower abdomen; a partly-concealed white patch, formed by the inner webs of the smaller tertials and adjacent coverts, is present on some (not all) individuals, varying in degree of development (this mark absent in *caprata*). Females agree with those of *S. c. anderseni* Salomonson from Mindanao in coldness of color tone and frequent presence of white wing-patch, but *anderseni* is a pale race with little or no shaft-streaking on the underparts. Males of the three Philippine races are not surely separable, although there is a tendency for *caprata* to have solidly black axillars, those of *randi* and *anderseni* usually being tipped with white.

Remarks: Specimens of *randi* have been examined from Negros, Bohol, and Siquijor. One female from Panay and one from Mindoro are too pale to be *randi* and too gray to be *caprata*, most nearly resembling the geographically distant *anderseni*. Additional specimens may show the existence of another race from the islands south of Luzon and north of Negros and Bohol. A single male from Ticao is unidentifiable.

This subspecies is named for Dr. A. L. Rand of the Chicago Natural History Museum, in recognition of his many contributions to our knowledge of the birds of the central Philippines.

Specimens examined: *S. c. caprata*: LUZON—20. *S. c. randi*: NEGROS—5; BOHOL—14; SIKUIJOR—1. *S. c. anderseni*: MINDANAO—6. *S. c. subsp.*: MINDORO—2; PANAY—1; TICA—1.

Aethopyga shelleyi minuta Bourns and Worcester

The subspecies *flavipectus* of the highly polytypic sunbird *Aethopyga shelleyi* is assigned by Delacour and Mayr (1946: 232) to the islands of Luzon, Mindoro, and Polillo. The subspecies *rubrinota*, described from the small island of Lubang (northwest of Mindoro), is considered by these authors to be "doubtfully separable." Gilliard (1950: 500) erroneously cites the type locality of *flavipectus* as Mindoro; Ogilvie-Grant based this name on Whitehead's specimens "from the mountains of Northern Luzon." I have been able to locate only four specimens from northern Luzon; all are in the AMNH, and all, unfortunately, are males. Comparison of these specimens with others from central and southern Luzon and Mindoro, and with *rubrinota* from Lubang (lacking in the AMNH collection and thus not seen by Delacour and Mayr) indicates not only that *rubrinota* is a valid race, but that *flavipectus* is confined to northern Luzon. A third race inhabits Luzon south of the range of *flavipectus*; these birds are inseparable from those of Mindoro, so the name *Aethopyga minuta* Bourns and Worcester (1894: 18), based on a lost unique type from Mindoro, may be revived for this additional race.

Males of true *flavipectus* from northern Luzon are similar to *rubrinota* of Lubang in being pale yellow below; however, the yellow is slightly deeper in *flavipectus*, and is palest and greenest on the throat, deepening posteriorly. In *rubrinota* the yellow is nearly uniform. The relative depth of the yellow of the rump agrees with that of the breast. The iridescence of the forehead is definitely more purplish, less green in *rubrinota*. This is also true, although difficult to see, of the posterior half of the iridescent moustachial stripe. This difference in iridescence does *not* hold true for the upper tail coverts, which are identical in color in the two races. The red of the back and sides of face and neck is slightly duller in *rubrinota*.

True *flavipectus* differs from *minuta* in being decidedly paler yellow below and on the rump, and in having the green of the crown darker and duller. Only one of the 9 adult males of *minuta* seen has a bill as slender as those of the 4 *flavipectus*. Width at the base of the bill, in millimeters, is as follows:

flavipectus: 3.1, 3.2, 3.3, 3.3

minuta (Luzon): 3.7, 3.7, 3.8, 3.8

minuta (Mindoro): 3.2, 3.7, 3.8, 3.9, 3.9.

Ripley and Rabor (1958: 73) found a difference in the red of the back between their three Mindoro males and a single male from Tayabas, Luzon. When additional specimens are examined, this difference is shown to be due to individual variation.

As mentioned previously, no females of true *flavipectus* from northern Luzon were available. Females of *rubrinota* agree with males with respect to general paleness of their yellows. Females of *minuta* appear to be highly variable, and the material at hand does not show conclusively whether or not this may be correlated with age. None of the specimens is marked "immature" or "adult" on the label, but I suspect that the

paler, grayer (less greenish below) females such as CNHM No. 98896 (Lamao, Bataan, Luzon) may be immature individuals.

The geographic variation of *Aethopyga shelleyi* in the northern Philippines parallels in some respects that of *Parus elegans* (Parkes, 1958). In both species there is a pale, greenish-yellow race in the mountains of northern Luzon, while the richly yellow birds of southern Luzon and Mindoro are inseparable. Ripley and Rabor (1958: 67-69) did not recognize the northern Luzon *Parus elegans montigenus*, but they had adequate material only from Mindoro. Their series of 17 adult males from Mindoro, 4 from northern Luzon, and 2 from southern Luzon, were all included within the series of 18, 37, and 19, respectively, assembled for my revision of this species. The larger series does not support the conclusions of Ripley and Rabor.

Specimens examined: *A. s. rubrinota*: LUBANG—4 ♂, 3 ♀. *A. s. flavipectus*: LUZON—Sablan, Benguet, 2 ♂; "North Luzon," 2 ♂. *A. s. minuta*: LUZON—Bataan Prov., 3 ♂, 1 ♀; Laguna Prov., 4 ♀; Tayabas (= Quezon) Prov., 1 ♂, 1 ♀. MINDORO—Mt. Halcon range, 4 ♂, 1 ♀; Rio Baco, 1 ♂, 1 ♀; Alcate, Victoria, 1 ♂, 1 ♀. Ripley and Rabor (1958: 14) list *Aethopyga shelleyi* among the species typical of "lowlands and rolling country" that also extend their range into "foothills and moderate mountain elevations (1,500-3,500 feet altitude)." But USNM No. 202457 was taken at 4,500 feet on a "spur of main ridge of Mt. Halcon," and AMNH Nos. 686595-6 at 5,000 feet on Mt. Dulangan.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A REMARKABLE NEW SPECIES OF NEOTROPICAL
AGALLIOPSIS AND THE PREVIOUSLY UNKNOWN
MALE OF AGALLIOPSIS INSCRIPTA OMAN
(HOMOPTERA: CICADELLIDAE: AGALLIINAE)

BY JAMES P. KRAMER

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The genus *Agalliopsis*, at least as presently conceived, is found in both the Nearctic and Neotropical Regions. Oman reviewed the North American species in 1933 (U.S.D.A. Tech. Bull., 372: 8-24); the Central American species in 1934 (Ann. Ent. Soc. America, 27(3): 445-453); and the South American species in 1938 (Ann. Carnegie Mus., 25: 354-362).

For the most part, leafhoppers of the genus *Agalliopsis* are not known for either their bright coloration or large size. Most of them are rather drab insects whose coloration involves various shades of brown, yellow or black. Few are more than 5 mm, while the great majority are 4 mm or less in length.

It was, therefore, surprising to find a strikingly colored undescribed species of comparatively gigantic size among the undetermined neotropical leafhoppers in the collection of the U. S. National Museum. Both W. E. China of the British Museum and R. Linnavuori of Turku, Tyttölyseo, Finland, were consulted regarding this species and they are also of the opinion that it is undescribed. In addition to the description of the new species, the male of *Agalliopsis inscripta* Oman is reported for the first time.

***Agalliopsis rex*, new species**

Length: Male 8.25 to 8.75 mm. Not very close to any described member of the genus, but with the posterior margin of crown sinuately curved laterally and produced behind eyes although not strongly so. Comparatively long, slender species. Genae longitudinally wrinkled. Posterior

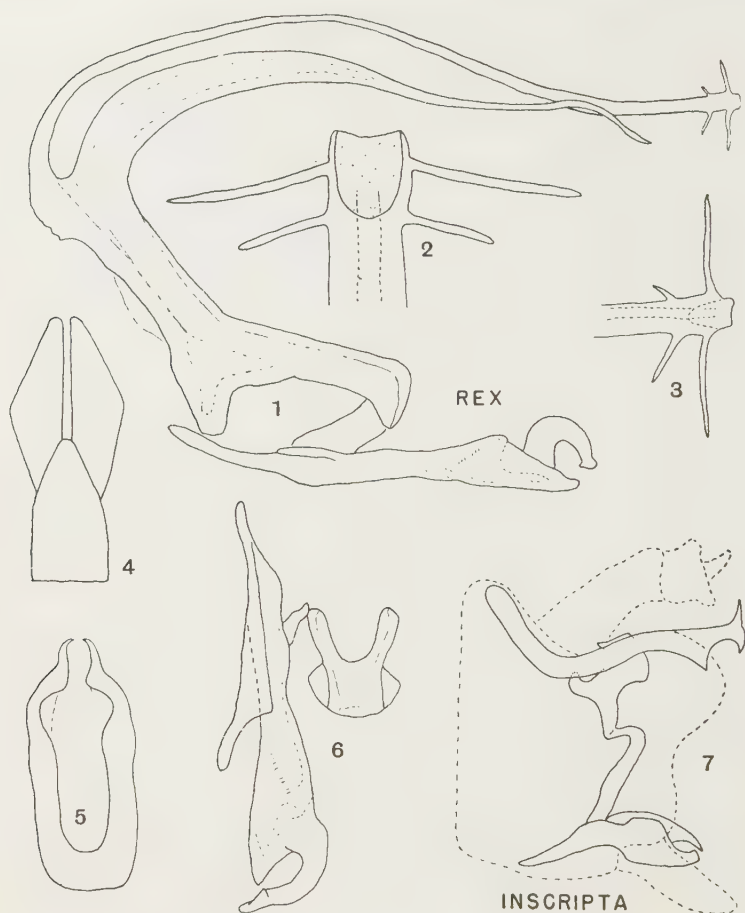


FIG. 1-7

margin of pronotum straight. Tegmina greatly exceeding abdomen in length and without second cross-vein between sectors.

Coloration: Head black, eyes brownish, ocelli and antennae reddish. Genae reddish in some specimens. Pronotum, scutellum, thoracic venter and legs black. Genital capsule black, rest of abdomen scarlet to red. Tegmina varying from scarlet to rusty red with apices black to dark fumose. Whitish bloom on some specimens, most noticeable on black areas of head and thorax.

Male genitalia: Pygofer simple, without processes or notches. Both valve and plates elongate (Fig. 4). Tenth segment terminating with a pair of hooklike processes (Fig. 5). Aedeagus exceedingly long, flattened,

slender, almost ribbon-like, with rather stout ventral accessory process (Fig. 1). Two pairs of slender processes at tip of aedeagus, and gonopore ventral, at apex (Fig. 2). Style in ventral view with mesal lobe or inner fork long and curved laterad; the connective short, Y-shaped and articulated with aedeagus (Fig. 6).

Holotype: Male, Ecuador, 3,000 ft. USNM No. 64866. Seven paratype males as follows: 1—same data as type; 1—Colombia; 1—Tuyo-c, Ecuador; 4—Zunái, Ecuador. Female unknown. Paratypes will be deposited in the British Museum and in the Linnavuori collection.

A. rex may be separated from all other members of *Agalliopsis* by its strongly contrasting scarlet to rusty-red and black color pattern, its large size and distinctive male genitalia.

Agalliopsis inscripta Oman

1934. *Agalliopsis inscripta* Oman, Ann. Ent. Soc. America, 27(3): 450.

The original description of this species was based upon three female specimens. The male specimen on hand fits this description exactly. Comparison with the only paratype in the USNM confirms the identity of the male.

Habitus, including size and color, as in female.

Male genitalia: Pygofer indented on both dorsal and caudal margins. Male plates not fused basally. Valve poorly defined. Tenth segment with sharp, broad, ventral, preapical expansion terminating nearly truncately, with sharp dorsal and ventral points of moderate length. Aedeagus short, moderately stout and irregular in outline. Styles rather short, with forks of about equal length. (Fig. 7.)

Single male in USNM collection with data: Antonio-Such., Guatemala, 26 January 1955, J. Castro. The holotype female was collected at Cerro Zunil, Guatemala, and is in the British Museum.

EXPLANATION OF FIGURES

Figs. 1–6.—*Agalliopsis rex* (holotype). 1. Lateral view of aedeagus (somewhat twisted), connective and style. 2. Ventral aspect of aedeagal apex. 3. Dorso-lateral aspect of aedeagal apex. 4. Ventral view of valve and male plates. 5. Tenth segment in dorsal view. 6. Ventral aspect of connective and style.

Fig. 7.—*Agalliopsis inscripta*, lateral view of entire genital capsule with all component parts. [Drawings made at various magnifications.]

PROCEEDINGS
OF THE
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VARIATION IN THE CUBAN LIZARD
LEIOCEPHALUS RAVICEPS COPE

BY ALBERT SCHWARTZ

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Of the five species of the genus *Leiocephalus* inhabiting Cuba, the least known is *Leiocephalus raviceps* Cope. Described by Cope in 1862 on the basis of specimens collected by the botanist Charles Wright in "eastern Cuba," *L. raviceps* was unknown to Gundlach except from the original description (Gundlach, 1875:354; 1880:34). Barbour (1914:301) followed Boulenger in regarding *L. raviceps* as a synonym of *L. vittatus* (= *L. cubensis*), but later he and Ramsden (1919:173) followed Stejneger (1917:53) in affirming the distinctness of the species, although they were not certain that it was Cuban. These two authors assumed that Wright's types came most probably from the Sierra de Yateras (probably owing to Gundlach's (1880) comment), but Ramsden was unable to find the lizard in that immediate area. This is not surprising, when it is known that *L. raviceps* is an inhabitant of the most xeric areas in Cuba, and is not known to occur in mesic areas or forest.

Cochran (1934:39) apparently was the first to report *L. raviceps* from a definite locality in Cuba; she cited specimens from four localities in the vicinity of Guantánamo Bay in Oriente, and erroneously (see Schwartz, 1959:110-11) from the Doce Leguas keys off Camagüey Province. Alayo (1951:109; 1955:16) reported the species from La Socapa, on the west side of the Bahía de Santiago, and from Laguna de Baconao on the coast road between Santiago de Cuba and Guantánamo. Thus, *L. raviceps* is now known from the region of the Bahía de Santiago east to the Bahía de Guantánamo; the only record of the species to the west of the Bahía de Santiago is Alayo's specimen from La Socapa, whereas the only record from east

of the Bahía de Guantánamo is that of Cochran from Boquerón.

During the summer of 1959, specimens of *L. raviceps* were collected at various localities on the south Oriente coast by myself, Ronald F. Klinikowski, and Barton L. Smith. During the Christmas holiday season of 1959, a new series was taken in the Sierra de Purial by myself and James R. Talada. All these collections were made under a National Science Foundation research grant. For the first time, ample series of specimens from various localities are available. It is not surprising that two subspecies are readily distinguishable in the material from Oriente. In addition to these fresh specimens, I have had the opportunity to examine the cotypes of *L. raviceps* in the U. S. National Museum, as well as a small series collected by Thomas M. Uzzell, Jr., and Richard Etheridge at the U. S. Naval Base on the east side of Guantánamo Bay, and a single specimen from Baracoa. I wish to thank Doris M. Cochran, Norman E. Hartweg, and Miguel L. Jaime García for permission to examine specimens respectively in the U. S. National Museum (USNM), Museum of Zoology, University of Michigan (UMMZ), and the Museo y Biblioteca de Zoología de la Habana (MBZH). Knowing my interest in the species, Messrs. Uzzell and Etheridge kindly allowed me to examine their very pertinent material. The illustrations are the work of Ronald F. Klinikowski; his work on my behalf is sponsored by a National Science Undergraduate Research Participation grant.

In addition to the specimens from Oriente, we collected a series of *L. raviceps* on the northern coast of Matanzas Province near Varadero. These specimens are the first extra-Oriente lizards of this species, and they too represent a distinct new form; a distance of some 690 kilometers separates this population from the nearest known Oriente population of *L. raviceps*.

In order to establish which of the three populations of *L. raviceps* best agrees with Cope's concept of the species, I have examined the seven cotypes of the species (USNM 4162). This series consists of two adult males and five adult females, all in fair condition considering their preservation for almost a century. Cope's (*op. cit.*:183) description of coloration and pattern are a composite of the series; he stated, "Above yellowish brown, with many short, narrow, black longitudinal lines, which are something arranged as a double series of dorsal

spots." In general, the males have the dorsal short lines (dashes), whereas the females have a double series of dorsal spots. This characterization of the cotypes, along with Cope's comment "Top of head light yellowish brown," is sufficient to restrict it to the population of *L. raviceps* which occurs east of the Bahía de Guantánamo, i.e., between Guantánamo and Cajobabo, and in the Sierra de Purial. The remainder of Cope's description is consonant with the allocation of the cotypes with this population, and examination of the series of cotypes confirms this arrangement. Comparison of the types with fresh material from this region, and with specimens of the new dark race from farther west along the Oriente coast, shows that this area is occupied by the nominate form.

Only Gundlach (1880:34) has attempted to restrict the type locality of *L. raviceps* Cope; this Cuban herpetologist restricted it to "the mountains near Guantánamo, Oriente." This general locality was not unlikely, since it is known that Wright collected in this area. Repeated search for *raviceps* in the mesic Sierra de Yateras by herpetologists yielded no specimens. However, the species does occur in the very different and xeric Sierra de la Vela to the southeast of Guantánamo on the east of the Bahía de Guantánamo. Thus if Gundlach's type locality restriction of "the mountains near Guantánamo" is understood to refer to the Sierra de la Vela or other of the dry coastal ranges, this locality may be regarded as correct.

I have seen no specimens from Guantánamo itself; I suspect that *raviceps* occurs to the south of that city, on the west side of the Bahía, in the xeric and *Opuntia*-studded plains which occur close to the city itself. We collected one specimen near Caimanera. To the southeast of Guantánamo, between the city and the U. S. Naval Base, no *raviceps* were collected, and in general this area now, at least, appears unsuitable. However, as one approaches the Naval Base, the typical xeric features of the flora and landscape appear, and the species should occur there, as it does in the Sierra de la Vela.

The population of *L. raviceps* between the Bahía de Santiago and the Bahía de Guantánamo differs in coloration, pattern, and certain features of scutellation from that to the east; for this western population I propose the name, in honor of Thomas

M. Uzzell, Jr., who collected the first fresh specimens of *L. raviceps* which I had seen, as:

***Leiocephalus raviceps uzzelli*, new subspecies**

Type: American Museum of Natural History (AMNH) 79321, from 18.2 kilometers east of Siboney, Oriente Province, Cuba, taken 25 July 1959; one of a series obtained by Ronald F. Klinikowski, Albert Schwartz, and Barton L. Smith. Original number 7867. See Fig. 1.

Paratypes: AMNH 79310–20, 79322–35, same data as type.

Specimens examined and not designated as paratypes: AMNH 79336–40, 26.6 km E Siboney; AMNH 79341–45, Laguna de Baconao, 21.8 mi E Siboney; AMNH 79346, 2 mi N Caimanera.

Distribution: The southern Oriente coast from the Bahía de Santiago to the Bahía de Guantánamo.

Diagnosis: A subspecies of *L. raviceps* characterized by dark tan coloration with sharply differentiated darker brown lateral fields, relatively prominent dark brown to black dorsal dashes or paired blotches, usually well defined postorbital blotch and more often incomplete than complete supraorbital semicircles.

Description of type: An adult male, with the following measurements (in millimeters): snout–vent length 65; tail 96, complete; snout to anterior border of tympanic opening 13.7; head width 11.4; supraocular scales 7/7; loreals 3; temporals 9; enlarged auricular scales 4/4; median head scales 4; prefrontal row complete 3 scales; frontoparietal row complete 5 scales; parietals in contact; semicircles incomplete; dorsal crest scales occiput to vent 65; dorsal crest scales occiput to axilla 27; scales around half body at midbody 33; fourth toe subdigital tricarinate scales 25/26.

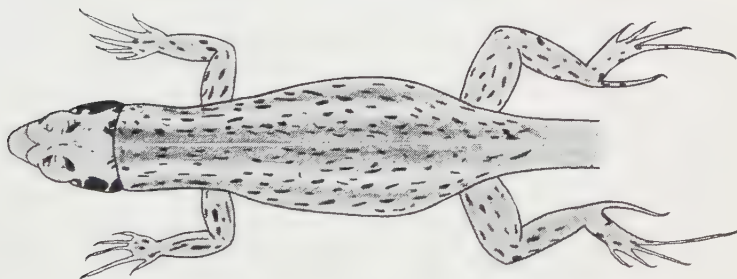
Coloration: The dorsal coloration in life is yellowish tan. There is a darker brown lateral field, which in life contained scattered yellow and red scales, extending from the eye to the groin. The dorsal surface of the head is likewise yellowish tan with some of the scales, especially the inner margins of the semicircles, outlined by black. The dorsum between the lateral fields shows a median zone which is set off laterally by a longitudinal paler zone. Ventral to the lateral field there is a longitudinal pale whitish band which extends from above the tympanic opening to the groin; this line is outlined below by a faintly gray longitudinal band, which merges gradually into the pale gray venter. The dorsal crest scales are not set off by their coloration from the remainder of the median dorsal tan band. The median zone includes a series of about 13 more or less triangular dark brown blotches, their apices pointed posteromedially; the anterior blotches are darker and more rectangular than the posterior ones. There are a few short, dark longitudinal dashes between the blotches. The next adjacent longitudinal zones, which have a paler ground color, are marked with scattered longitudinal dashes, involving two to three scales. The lateral fields are marked with diagonal dark dashes, which are prominent on the sides and somewhat fainter on the neck; these dashes continue more ventrally between the limbs to midway between the limb in-



1.



2.



3.

FIG. 1-3

sections. Scattered light scales in and below the lateral fields were yellow in life; these light scales continue onto the abdomen as a series of transverse rows of white dots against the pale gray of the abdomen. The dorsal surfaces of the limbs are tan; the hindlimbs have a combination of short

brown dashes and scattered cream colored scales on their dorsal surfaces, and these markings continue onto the dorsal surface of the foot. The post-orbital blotch is represented by a slightly gray area on the cheek, with a few brownish scales intermingled with the gray. The upper labials are suffused with tan; the lower labials have deeper tan pigment along the infralabial sutures, giving the lower lip a somewhat mottled appearance. Three white bands radiate ventrally from the eye, the posterior two separated by a vertical black bar which extends ventrally from the middle of the eye. The entire ventral surface is pale gray, and the throat is immaculate. The underside of the hindlimbs and the posterior third of the abdomen have scattered brown dots; these dots extend as well onto the basal portion and sides of the tail. In addition, cream colored scales occur on the underside of the hindlimbs and tail. Thus these members are pale gray with scattered brown spots, and more abundant cream colored spots.

Variation: In snout-vent length, 21 adult male *L. r. uzzelli* average 63.2 mm (55-71); 9 adult females average 48.1 (45-53). Dorsal crest scales (combined data for both sexes) in occiput-vent length average 63.4 (56-69), and dorsal crest scales in occiput-axilla average 26.0 (23-31). One half scales at midbody average 32.4 (29-36), loreals 3.3 (2-5); temporals, 11.0 (8-13), subdigital fourth toe tricarinate scales 24.3 (22-28). The parietals are always in contact, and the supraorbital semicircles are more often incomplete (53%) than not. The supraoculars are most often 7/7 (68%), with 6/6 occurring as the next most frequent (13%) category. Variation in this character includes in addition counts of 5/5 (3%), 5/6 (6%), 6/7 (6%), and 7/8 (3%). If all counts which include at least 7 supraoculars (at least unilaterally) are combined, 77% of the population is differentiated from the 23% which have counts ranging from 5/5 to 6/6.

Since there is a certain amount of sexual dimorphism in pattern, the two sexes will be discussed separately. Males can be distinguished from females in that the former have two pairs of enlarged postanal scales. All males are relatively darkly pigmented in life, with a conspicuous lateral field as compared with the paler *r. raviceps*. Some males demonstrate a yellowish suffusion of the head scales in life, but in general this has disappeared in preservative; the more common condition in *uzzelli* is the unicolored tan head scales. The dorsal pattern is like that described for the type in most cases—a series of paired dark rectangular or triangular blotches in the median tan zone. Some specimens lack these blotches and have them supplanted by a uniform series of longitudinal dashes or even dark dots; any combination of these patterns may occur on the same individual. The lateral fields are always dark and prominent with bold black diagonal dashes. The postorbital blotch varies in intensity, but the type is unusual in the faint pigmentation of the postorbital area; usually the cheek is covered by a heavy black blotch, or there is at least some black pigment in this area, and the "blotch" may appear as a hollow or open-ended rectangle, brown to tan centrally; the blotch is, even at its most reduced, usually better defined and more prominent than it is in *r. ravi-*

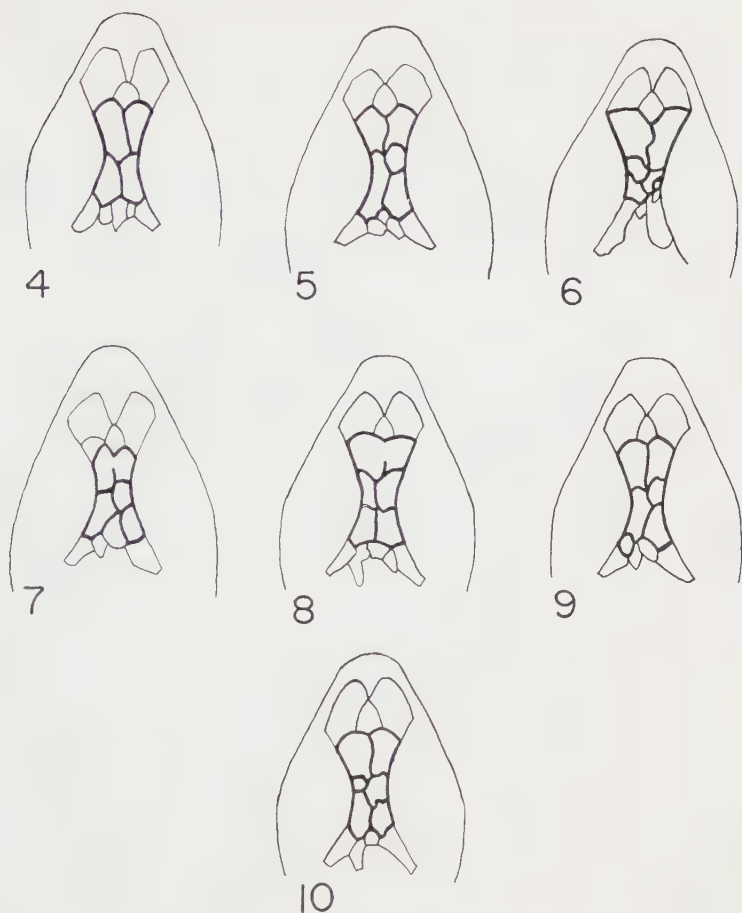


FIG. 4-10

ceps. Unregenerated tails have a pattern of about 17 dorsal chevrons, their apices pointed posteriorly; the ground color of the tail is faintly pinkish in life, and this serves to distinguish these lizards in the field. The throat usually is immaculate, varying in color from white to very pale lavender to gray, with occasional clear cream colored scales scattered on its margins. Some males show a few gray lines or dots on the throat; this gray pigmentation occurs in juveniles more regularly than adults, but it appears not to be strictly ontogenetic in nature. The undersides of the hindlimbs, posterior abdomen, and basal portion of the tail are dotted with dark brown as are these members in the type.

The females present the same dark appearance as the males, but are

more distinctly lined longitudinally (*cf.* Schwartz, *op. cit.*, sexual dimorphism in *L. cubensis* and *L. stictigaster*). The female pattern is an intensification of that described for the males—the paired dorsal blotches (only one female shows any additional dorsal pigmentation in the form of dark dashes in the median zone). The sides have the diagonal dark dashes which may be somewhat inconspicuous due to the dark coloration of the lateral fields. The hindlimbs have dorsal dark dashes, but these may be obscure. The postorbital blotch is usually demonstrated by a slightly darker brown area on the cheek. The females, in contrast to the males, almost always have dark gray dots, often aligned into longitudinal rows, on the throat, and usually lack any dark dots on the underside of the hindlimbs, although the belly usually has brown dots on its posterior third. Both sexes have the pale facial markings described for the type, but they are more clearly expressed in the females than the males. Usually there are but two, rather than three, light subocular areas, the anteriormost being obscured by the deposition of tan pigment, and the posterior two being separated by a definite vertical black bar. The juvenile males resemble the females in pattern and pigmentation very closely.

All specimens but six have four median head scales (see Fig. 4); five specimens have five median head scales (see Fig. 5) and one has six (see Fig. 6). This condition of five and six, rather than four, scales is caused either by the unequal transverse division of one of a pair of scutes or by the unequal division of both members of a pair.

Comparisons: *L. r. uzzelli* differs from its relative, *L. r. raviceps*, to the east in both coloration and scalation, as follows: Although both races are tan dorsally, *uzzelli* is by far the darker of the two; *raviceps* has a distinctly faded or “washed out” appearance (see Fig. 2), whereas *uzzelli* is darker. Male *uzzelli* have the lateral fields very dark, and the dorsum is marked either with dark brown or black dashes, often organized into two series of paired black or brown blotches on either side of the dorsal midline. This feature seems to be a retention into the adult of the juvenile (and female) blotched pattern. Even if the dorsal pattern is composed of dashes, there are at least two pairs of blotches in the nuchal area, and thus at times the subspecies *uzzelli* may superficially resemble *L. m. macropus*. The postorbital blotch is usually demonstrated, in contrast to the condition in *raviceps*, and when best expressed, is black and outlined anteriorly by a light line extending ventrally from the eye onto the posterior supralabials, and extends posteriorly to the tympanic opening. Ventrally, males of the two subspecies are much alike, except that *uzzelli* males often have a few gray lines or dots on the throat, and the undersurface of the hindlimbs, basal portion of the tail and posterior abdomen are much more heavily and profusely marked with dark brown dots. In contrast to the dull face and labial markings of *raviceps*, *uzzelli* has distinct facial markings of dark brown or black consisting of three lines (one just below the canthus rostralis, another from the anterior corner of the eye, and the third from the posterior half of the eye) which encloses three light areas and extend onto the supralabials. The infralabials are regularly mottled white

and dark brown to tan. Female *uzzelli* resemble female *raviceps* except that the latter females are much paler and appear faded, and lack the female *uzzelli* face pattern of a single vertical black line through the center of the eye. The gray throat markings of female *uzzelli* are more pronounced and darker than those of *raviceps*, and one female demonstrates brown dots on the underside of the hindlimbs.

As noted above, the two races differ in general coloration, *raviceps* being more distinctly yellowish-tan than *uzzelli*. The yellowish suffusion on the head of *raviceps* is not shown so distinctly in *uzzelli*, although occasional specimens do show it. *L. r. uzzelli* shows yellow or red dots (lateral scales) on the sides and in the area of the shoulder, and apparently lacks the green lateral scales of *raviceps*.

Males of the two subspecies do not differ in snout-vent length; 23 adult male *raviceps* average 66.5 mm (61-71). Eleven adult females average 54.5 (52-57); it is possible that the females of *uzzelli* are consistently smaller than those of *raviceps*, but there are too few *uzzelli* females available to be certain. At present the females of the two races can almost be separated by size alone (largest female *uzzelli* 53 mm, smallest female *raviceps* 52 mm). Means and extremes of scale characters of *raviceps* are: dorsal crest scales in occiput-vent length 64.2 (55-74); dorsal crest scales in occiput-axilla length 27.5 (22-32); one half scales at midbody 32.3 (27-36); loreals 3.6 (2-5); temporals 11.6 (9-15). None of these counts are significantly different from those of *uzzelli*. However, tricarinate subdigital fourth toe scales 25.5 (21-30) in *raviceps*; inspection of Fig. 11 indicates that this count is significantly higher than that of *uzzelli*. Both races usually have four median head scales; only one *r. raviceps* examined had five median head scales. Both races usually have 7/7 supraoculars; 71% of *r. raviceps* have 7 or 8 supraoculars at least unilaterally. Parietal contact occurs in 95% of the *r. raviceps*; the semicircles are complete in 81% of the lizards. This is in contrast to *uzzelli*, in which 47% of the specimens have complete semicircles; the difference is significant.

Remarks: The south Oriente coast lies in the rain shadow of the Sierra Maestran system; specifically, between the Bahía de Santiago and the Bahía de Guantánamo, the range involved (which is considered as part of the Sierra Maestra by Marrero, 1951: 584) is the Cordillera de la Gran Piedra. North and east of the Guantánamo Basin are the Sierra del Guaso, the Sierra de Maquey and the Sierra de la Vela. The extensive Sierra de Purial (Las Cuchillas) limits the very narrow coastal area from east of Guantánamo to Cabo Maisí. Marrero (*op. cit.*: 658) described the coast from Guantánamo to Cabo Maisí in the following accurate terms: "The southern coast of Oriente, from Guantánamo eastward, is in reality a desert, with infrequent rains during the entire year and a xerophytic vegetation, in which cacti predominate, interrupted only by the gallery vegetation at the base of palms, together with the rare rivers which descend to the ocean." Later, Marrero (p. 659) mentioned the botanist Victorin's appellation for part of this region as the "inferno of Maisí"; such descriptions are verbally adequate to describe the intense heat, sandy and rocky

soils, and xerophytic plants which characterize this coastal strip. The coast from Santiago to Guantánamo, while nonetheless hot and xeric, is less so than the Guantánamo area, and supports occasional stands of deciduous trees, mangroves, and palms, along with some low herbaceous cover. *L. raviceps* is widespread between Guantánamo and Cabo Maisí, but appears to be less so and more restricted to the niche of sandy soil and *Opuntia* between Santiago and Guantánamo. However, in this latter region, it has been found sparingly in other habitats, which are invariably dry. For example, at Laguna de Baconao, we took both *r. uzzelli* and *m. macropus* in close proximity to one another, at the edge of the mangrove border of the lake. However, *macropus* occurred within the shady forest on mud and moist ground, whereas *uzzelli* shunned this cooler habitat in preference to the dry and extremely hot hillsides.

Although the single specimen of *L. raviceps* from Baracoa (MBZH 136) is the only individual from the north coast of Oriente, and is separated from the south coast *r. raviceps* population by the Sierra de Purial, this lizard does not differ in any way from the southern coastal specimens of *r. raviceps*. It has the herringbone dorsal pattern which occurs in south coast *r. raviceps* and not in *uzzelli*. Although we collected *Leiocephalus* in the Baracoa area, no *raviceps* were taken. The series of lizards from the Sierra de Purial (AMNH 83791–806, from 4.6 mi N Cajobabo) shows that in extreme eastern Cuba the distribution of this lizard may not be completely coastal. Under proper conditions it may invade non-coastal montane areas, provided that the soil and moisture conditions are suitable. At this Cajobabo locality, the lizards were taken along the Cajobabo–Baracoa road in a dry and sunny road cut, as they ran about on the broken shale fragments where there was little or no plant cover. Such relatively isolated populations between the south coast and Baracoa may well maintain genetic continuity between the populations of the two coasts. On the other hand, *r. raviceps* may continue to Baracoa via a more or less continuous population from the south coast around Cabo Maisí and thence to Baracoa.

The absence of *L. raviceps* west of the Bahía de Santiago is puzzling; as noted previously, the only record for the species in this area is at La Socapa, which is on the west side of the bay itself. The common *Leiocephalus* on the coast south of the Sierra Maestra is *L. macropus*; there are no obvious differences in the vegetation or substrate of this coastal strip as compared to that of the Santiago–Guantánamo strip except the absence of the sand-*Opuntia* niche. It is possible that *raviceps* and *macropus* are competitors, and that the former has been unable to become established to the west of Santiago; another possibility is that the western coast is too moist for this species and the apparent absence of sandy soils and *Opuntia* is a limiting factor.

The completely unexpected occurrence of *L. raviceps* in Matanzas Province is indeed surprising. The series of 22 lizards from two localities near Varadero is very different in several features from *L. raviceps* in

Oriente, and accordingly, in honor of Ronald F. Klinikowski, the discoverer of this western population, I propose the name:

***Leiocephalus raviceps klinikowskii*, new subspecies**

Type: AMNH 83326, adult male, from 4.5 kilometers southwest of Varadero, Mantanzas Province, Cuba, taken 8 September 1959, one of a series collected by Ronald F. Klinikowski, Albert Schwartz, and Barton L. Smith. Original No. 8528. See Fig. 3.

Paratypes: AMNH 83327-46, same data as type; AMNH 83347, 5.5 kilometers southwest of Varadero, Mantanzas, 8 September 1959, R. F. Klinikowski.

Distribution: Known only from the coast southwest of Varadero in Matanzas Province, Cuba.

Diagnosis: A subspecies of *L. raviceps* characterized by very pale yellowish tan dorsal coloration, lateral fields very inconspicuous and hardly differentiated from ground color, dorsum with prominent black dorsal dashes, poorly defined postorbital spot, usually 5 or 6 median head scales and 6/6 supraoculars, and high number of dorsal crest scales and scales around midbody.

Description of type: An adult male, with the following measurements in mm and counts: snout-vent length 69; tail 74, distal one third regenerated; snout to anterior border of tympanic opening 14.4; head width 11.8; supraocular scales 6/6; loreals 5; temporals 16; enlarged auricular scales 4/4; median head scales 6; prefrontal row complete 3 scales; frontoparietal row complete 5 scales; parietals in contact; semicircles complete; dorsal crest scales occiput to vent 62; dorsal crest scales occiput to axilla 27; scales around one half body at midbody 35; fourth toe subdigital tricarinate scales 24/26.

Coloration: The dorsal coloration in life is pale yellowish-tan, almost sand colored, with the dorsal crest scales immaculate pale yellow. There is little evidence of longitudinal zonation and the lateral fields are not appreciably darker than the dorsum itself, nor are they separated from the ventral gray coloration by an additional band of tan; the effect laterally is a gradual blending of the dorsal yellowish-tan coloration into the gray of the abdomen. The dorsal surface of the head is yellowish-tan with black pigment stippled over the head scutes, especially the prefrontals, posterior supraoculars, and the parietals and interparietal. The entire dorsum and lateral field area is marked with short black longitudinally aligned dashes (see Fig. 3), which become obscure on the neck and form two very faint pairs of nuchal blotches which are barely discernible. Cream colored isolated scales on the sides extend onto the abdomen in a series of five parallel rows, with additional cream scales on the abdomen anterior to the hindlimbs. Some of the tan scales in the lateral field area were orange basally in life. The forelimbs are mottled tan dorsally and the fingers are immaculate pale tan, giving the lizard a distinctly pale fingered appearance. The hindlimbs show short black longitudinal dashes on all sections, but they are arranged as spots on the foot itself; there are

additional light scales on the dorsal surface of the hindlimbs. The postorbital blotch is represented by a vertical black bar behind the eye, and a darker irregular blotch posterior to this bar; the cheek itself is tan. Three gray lines radiate from the eye, one below the canthus rostralis, another from the anterior corner of the eye, and a third from the center of the eye; these extend to the supralabials, and are continued on the infralabial sutures. The entire ventral surface is gray, with a darker gray suffused area across the chin, another on the throat, and a few scattered cream scales on the throat. The undersurface of the hindlimbs is almost white, again with a few light tan dots scattered over the shank; darker dots occur on the posterior abdomen and on the underside of the tail. The unregenerated portion of the tail shows about six dull gray chevrons with the apices directed posteriorly; the ground color of the tail is dull reddish-tan in life.

Variation: In snout-vent length, four adult male *L. r. klinikowskii* average 58.5 mm (53-69); eight adult females average 51.9 mm (46-59). Dorsal crest scales (combined data for both sexes) in occiput-vent length average 66.2 (61-71), and dorsal crest scales in occiput-axilla length average 27.0 (24-29). One half scales at midbody average 35.3 (32-39), loreals 4.2 (4-5), temporals 13.9 (11-16), subdigital fourth toe tricarinate scales 25.9 (21-27). The parietals are more often (86%) in contact than not, and the supraorbital semicircles are always complete.

Of the three paratypic males, one resembles the type in dorsal pattern; the remaining two individuals have the dorsal zonation somewhat more apparent, and still retain some remnants of the juvenile male paired blotch pattern. All have pale yellowish-tan dorsa, very pale fingers, immaculate yellow dorsal crest scales, chevrons (about 18) on the complete tails, rather diffuse gray postorbital blotches, black stippling on the head scutes, and dark facial and labial markings. The three paratypic males lack brown dots on the undersurface of the hindlimbs, but show them on the underside of the base of the tail. One has a completely immaculate throat, and the remaining two have a gray suffusion and scattered diffuse gray dots. The eight adult females are much as the females of *raviceps* and *uzzelli* except that they are much paler; all but one show the paired female blotches and dashes in the lateral fields. The single exception is unusually gray and has dashes in the lateral field area and very pale gray dashes dorsally. All females have black on the head scutes, postorbital blotches absent or if present diffuse and gray, and a contrasting face pattern of gray or black lines. The inter-infralabial sutures are distinctly black, and the throat always has some indication of gray dots or dashes. The underside of the hindlimbs is usually immaculate white, but a few individuals have indications of very light tan dots. The dark brown belly dots are present and rather extensive.

There are 10 juvenile female paratypes ranging in snout-vent lengths from 26 to 44 mm. These show the same pattern as the adult females and differ only in the more definite dark gray chin and throat markings.

Nineteen of the 22 specimens of *klinikowskii* have five or six median

head scales; variation in this feature is shown in Figs. 4 to 10. Only two individuals have four median head scales (Figs. 4 and 7). Fig. 7 shows that, although there are only four head scales in this case, anterior continuation of the incipient median suture would convert this pattern to five median scales. The other lizard with four median head scales differs in no wise from four-head-scaled individuals of *raviceps* and *uzzelli* (Fig. 4). Thus almost 100% of *linikowskii* have either 5 or 6 median head scales, at least incipiently.

Variation in number of supraoculars is great; 6/6 occurs in the most individuals (12 lizards, 55%), and 6/7 in six lizards (27%). Only two (9%) *linikowskii* have 7/7 supraoculars, in contrast to 68% in *uzzelli* and 44% in *raviceps*. Other counts in *linikowskii* are 6/8 and 7/8 (one individual each). Counts of more than 6/6 arise in the following three ways: (1) a supraocular, usually the sixth, is divided longitudinally so that two scales occupy the area of one scale; (2) the sixth is replaced by two scales transversely, thus giving the usual 7 supraoculars of *raviceps* and *uzzelli*; (3) a small supraocular is added anteriorly from fusion or enlargement of one of the semicircle scales. The occurrence of six supraoculars at least unilaterally is shown in all but one specimen (which has 7/8) of *linikowskii*.

Comparisons: *L. r. klinikowskii* differs from both *raviceps* and *uzzelli* in its very pale coloration, light to no ventral spotting on the hindlimbs, usually very inconspicuous lateral fields, relatively faint postorbital blotch, pale fingers, and immaculate yellow dorsal crest scales. In scalation, the Matanzas race differs in usually 6/6 supraoculars, although a relatively high percentage (32%) of *raviceps* has this number of supraocular scales.

From *uzzelli*, *linikowskii* differs in having the semicircles always complete, whereas the former has the semicircles more often incomplete. Inspection of Fig. 11 shows that *linikowskii* differs significantly from *uzzelli* in number of dorsal crest scales in occiput-vent length, from *raviceps* and *uzzelli* in number of one half midbody scales, and from *uzzelli* in number of fourth toe scales.

In size, *linikowskii* males average smaller than males of both the other races; this is probably an artifact of the small size of the sample of male *linikowskii*. Female *linikowskii* reach a larger size than females of the other races, although the average of the series is intermediate between that of *raviceps* and *uzzelli*. It is especially interesting that, despite the apparent great hiatus between the known range of *linikowskii* and *uzzelli*, the scale differences between these two races are not more striking.

Remarks: The habitat of *L. r. klinikowskii* is apparently the sandy beaches of Punta de Hicacos. It is probable that the race has a wider distribution than presently known; since much of the beach area of the Varadero area is now converted to recreational use, collecting must be carried on at less populated areas. The type locality is a stretch of open beach, with almost no herbaceous cover except *Ipomea* and scattered tufts of grass, separated from the Matanzas-Varadero highway (Via Blanca) by a stand of introduced *Casuarina*. The single lizard from 5.5 kilometers

DORSAL CREST SCALES

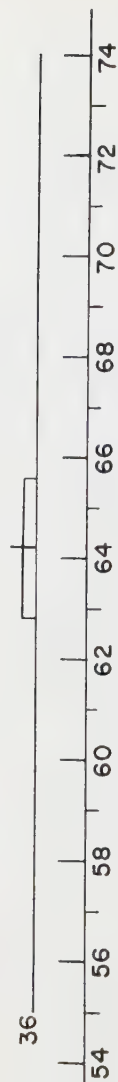
KLINIKOWSKI



UZZELLI



RAVICEPS



1/2 MIDBODY SCALES

KLINIKOWSKI



UZZELLI



RAVICEPS



FOURTH TOE SCALES

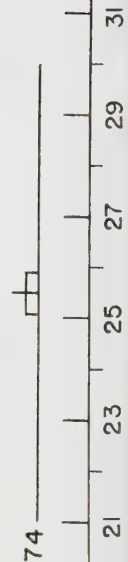
KLINIKOWSKI



UZZELLI



RAVICEPS



southwest of Varadero was taken on sandy soil in rather dense grassy cover. The lizards were all captured by hand; this was a relatively simple task since there was such little cover. They sought refuge in land-crab burrows, and when especially hard pressed, would bury themselves in the sand much in the same manner of *Uma* and would quickly disappear from view.

I suspect that other populations of *L. raviceps* remain to be discovered. Sandy areas on the north coast from Matanzas to northern Oriente may well harbor disjunct populations of this lizard. The only other comparable area which I have visited on the north coast is Playa Santa Lucía in eastern Camagüey; no *raviceps* were collected there. However, it is interesting that the type locality of *L. r. klinikowskii* was visited in the summer of 1958, and these lizards were not observed at this or any other collecting locality along the Punta de Hicacos' north coast. Visits in 1958 and 1959 to a locality 13 kilometers northeast of Matanzas did not yield specimens of *L. raviceps*, and I doubt that the species occurs in this immediate region; here there is no beach as such, the shore having a formation of *diente de perro* limestone with sandy dunes behind the limestone, covered with dense herbaceous and woody vegetation which is apparently unsuitable for *L. r. klinikowskii*.

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EXPLANATION OF FIGURES

Fig. 1.—*Leiocephalus r. uzzelli*, new subspecies, dorsal view of type (AMNH 79321).

Fig. 2.—*Leiocephalus r. raviceps*, dorsal view (AMNH 79350).

Fig. 3.—*Leiocephalus r. klinikowskii*, new subspecies, dorsal view of type (AMNH 83326).

Figs. 4 to 10.—Dorsal view of median head scales of *L. raviceps* showing variation in number from four to six scales; figures from specimens as follows: 4. AMNH 79314; 5. AMNH 83327; 6. AMNH 79310; 7. AMNH 83328; 8. AMNH 83331; 9. AMNH 83333; 10. AMNH 83326.

Fig. 11.—Counts of dorsal crest scales in occiput–vent length, scales around one half of body at midbody, and subdigital tricarinate scales on fourth toe in three Cuban subspecies of *Leiocephalus raviceps*. Horizontal line indicates range of variation in sample; vertical line, the mean; hollow rectangles indicate two standard errors on each side of the mean. If rectangles on two sets of data do not overlap, a statistically significant difference between the means is suggested. Sizes of individual samples are given to the left of each line. Higher number of individual counts in fourth toe scales is due to counting the number of subdigital scales on the fourth toe of both the right and left foot.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW SPECIES OF BAT OF THE GENUS *ANTROZOUS*
FROM CUBA

BY ROBERT T. ORR AND GILBERTO SILVA TABOADA

*California Academy of Sciences and Speleological Society of
Cuba*

Until recently the known range of the vespertilionid genus *Antrozous* has been from southern British Columbia south to Querétaro, México, and from the Pacific coastal states east to Kansas. Within this continental area, in the opinion of present writers, there is a single species, *Antrozous pallidus*.

In 1957 an American Museum of Natural History expedition discovered a population of bats belonging to the genus *Antrozous* on Maria Magdalena Island of the Tres Mariás group off the coast of Nayarit, México. Study of specimens secured revealed that they represented a distinct new species which was given the name *Antrozous dubiaquercus* by Van Gelder (Amer. Mus. Nov., 1973: 1-14, 1959).

Meanwhile, the existence of a second insular species of *Antrozous* was suspected. While collecting bats with the aid of a mist net north of the mountains of western Cuba in Pinar del Río Province in the fall of 1956 the junior author and Dr. Karl F. Koopman secured a live individual that, as far as external appearance was concerned, appeared to belong to the genus *Antrozous*. Unfortunately the bat escaped the night that it was caught but not before the collectors had several hours in which to examine it closely and be certain of its generic identity.

It was not until December 2, 1958, that further evidence on the existence of *Antrozous* in western Cuba was obtained. On this date one of us (Silva) secured a skull of a nyctophiline bat in a cave in Pinar del Río Province. The skull may have come from a barn owl pellet as there were a number of the latter present in the cave in various stages of decomposition. No

mandibles were found but the skull itself is in an excellent state of preservation. Only the tympanic bullae and parts of the parietals are missing. The sagittal crest is very well developed and the teeth quite worn, indicating an old adult.

On comparing this skull with those of specimens of *Antrozous pallidus* from selected localities throughout its range the specific distinctness of the Cuban specimen was at once apparent. It seems desirable, therefore, to describe this Cuban species even though it is presently known only from a skull.

***Antrozous koopmani*, new species¹**

Type: Skull only, lacking mandibles; No. 11846, Calif. Acad. Sci.; Cueva del Hoyo García, Municipio de San Juan y Martínez, Provincia de Pinar del Río, Cuba, 2 December 1958; found by Gilberto Silva Taboada.

Diagnosis: Size very large compared with that of other members of the genus *Antrozous*; teeth proportionately small; combined temporal and orbital fossae proportionately large as a result of elongation of the cranium rather than the rostrum.

Comparisons and remarks: Five geographic races of *Antrozous pallidus* are recognized. Some of these are well marked subspecies while others are less clearly defined. Size and color are the principal characters used to distinguish these forms. Measurements of four of these five subspecies (all except *A. p. cantwelli*) are shown in Table 1. As will be noted greatest body size is attained in the Pacific coastal area west of the Sierra Nevada-Cascade axis within the range of the subspecies *pacificus*. Specimens from San Luis Obispo and Kern counties of west-central California exhibit maximum size for the species. Specimens from northwestern California in Mendocino, Napa and Lake counties average smaller. Measurements given for *pacificus* by Van Gelder (op. cit., p. 13) for members of this race from eastern Tulare County in California are even smaller. *Antrozous p. cantwelli* of the northern Great Basin region is, reportedly, smaller than *A. p. pacificus*. The same is true of *A. p. bunker*i known from Kansas and Oklahoma. The minimum in size is attained by *A. p. minor* of southern Baja California and *A. p. pallidus* which occurs in the desert regions of southwestern United States and northern México. In size, therefore, this species follows Bergmann's Rule in a general way.

One of the characters of *Antrozous koopmani*, however, is its large size. Not only do its measurements greatly exceed those of *Antrozous pallidus pallidus* but even those of the largest individuals of the Pacific coastal race *A. p. pacificus* measured by the writers. The shortest distance between the known range of *A. pallidus* and the tip of western Cuba is approximately nine hundred miles most of which is across the Gulf of México.

¹ Named for Dr. Karl F. Koopman who, with the junior author, first discovered the genus *Antrozous* in Cuba and whose studies have contributed much to our knowledge of bats in the West Indies.

TABLE 1.—Cranial measurements, in millimeters, of adult specimens of *Antrozous*.

SPECIES AND LOCALITY (Specimens measured)	GREATEST LENGTH	CONDYLOBASAL LENGTH	ZYGOMATIC BREADTH
<i>Antrozous koopmani</i>			
Cuba (1)	24.3	21.7	14.0
<i>Antrozous pallidus pacificus</i>			
Northern California (28)	21.6 (21.0–22.7)	20.0 (19.2–20.9)	13.2 (12.3–13.9)
South-central California (43)	22.6 (21.9–23.6)	20.9 (20.0–21.7)	13.7 (13.1–14.4)
<i>Antrozous pallidus bunkeri</i>			
Barber County, Kansas (4)	21.8 (21.5–22.3)	20.0 (19.7–20.4)	13.7 (13.4–14.0)
<i>Antrozous pallidus pallidus</i>			
Southern Arizona and New Mexico (12)	19.6 (18.6–20.5)	18.1 (17.3–19.0)	12.3 (11.5–13.2)
Coahuila and Durango, México (5)	20.0 (19.5–20.4)	18.4 (17.9–19.2)	12.3 (12.0–12.6)
<i>Antrozous pallidus minor</i>			
Miraflores, Baja California (2)	20.4 (20.3–20.5)		11.9 (11.5–12.3)

It is possible that the genus *Antrozous* may have arrived in Cuba originally from Yucatan. At present these two areas are separated by about one hundred and twenty-five miles of water. To the best of our knowledge, however, no bats of the genus *Antrozous* have been taken on the Yucatan peninsula nor south of a point five hundred and fifty miles north of the Isthmus of Tehuantepec.

Acknowledgments: The writers are indebted to Dr. Richard Van Gelder of the American Museum of Natural History for permission to study his manuscript and drawings of *Antrozous dubiaquercus* prior to publication. For permission to study specimens of the genus *Antrozous* under their care the writers are indebted to Barbara Lawrence of the Museum of Comparative Zoology, the late G. H. H. Tate of the American Museum of Natural History, W. H. Burt of the University of Michigan Museum of Zoology, D. H. Johnson of the United States National Museum, S. B. Benson of the University of California Museum of Vertebrate Zoology and Philip Hershkovitz of the Chicago Museum of Natural History.

Specimens examined: A total of 239 from the following localities:

Antrozous pallidus pacificus: CALIFORNIA—Humboldt County, Hoopa Indian Reservation, 8; Miranda, 1; Mendocino County, near Hearst, 3; Lake County, Mirabel Mine, 19; Napa County, ½ mi S Angwin, 1600 ft,

4; Sonoma County, Cloverdale, 3; Marin County, Inverness, 2; San Rafael, 1; Contra Costa County, Pine Canyon, 1; Walnut Creek, 1; Alameda County, Hayward, 1; 7 mi SE Livermore, 1; San Mateo County, Belmont, 3; Santa Clara County, Stanford University, 41; Bell Station, 1; Gilroy, 1; San Joaquin County, Farmington, 3; Tuolumne County, Long Barn, 1; San Luis Obispo County, 4½ mi NE Shandon, 44; Shandon, 5; 9 mi W Simmler, 1; Kern County, 2½ mi NW Carneros Spring, 21; Carneros Spring, 2; Wheeler Ridge, 600 ft, 2; Lebec, 5; Ft. Tejon, 3; Los Angeles County, 1 mi S Lankershim, 2; Pasadena, 1; Sierra Madre, 5. Total 186.

Antrozous pallidus pallidus: CALIFORNIA—Inyo County, Coso Mountains, 2; ARIZONA—Yavapai County, Camp Verde, 19; Gila County, White Mountains, 1; Gila Mountains, Tinajas Altas, 4; Pima County, Santa Catalina Mountains, 1; Santa Cruz County, 7 mi N Patagonia, 4700 ft, 4; UTAH—Millard County, Desert Range Experimental Station, 1; NEW MEXICO—Bernalillo County, Carasal, 1; Dona Ana County, Las Cruces, 3800 ft, 3; TEXAS—Brewster County, Chisos Mountains, Kibee Springs, 5700 ft, 1; MÉXICO, COAHUILA—San Pedro, 1; Jaral, 1; Los Delicias, 2; DURANGO—10 mi S Lerdo, 4500 ft, 2. Total 43.

Antrozous pallidus minor: MÉXICO, BAJA CALIFORNIA—Miraflores, 2. Total 2.

Antrozous pallidus bunkeri: KANSAS—Barber County, 5½ mi S Sun City, 5; 7 mi S Sun City, 2. Total 7.

Antrozous koopmani: CUBA, PROVINCIA DE PINAR DEL RIO—Municipio de San Juan y Martínez, Cueva del Hoyo García, 1.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

ON THE IDENTITY OF *STENOPHILUS GRENADAE*
(CHAMBERLIN) WITH A KEY TO THE KNOWN
NORTH AMERICAN CONGENERS
(CHILOPODA: GEOPHILOMORPHA:
HIMANTARIIDAE)

By R. E. CRABILL, JR.

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In presenting a first synonymical list of the known American Himantariidae I was unable confidently to refer several questionable species even provisionally to a genus (1959b:157). The types were apparently unavailable, and the original descriptions failed to present sufficient information. The identity of one of these species, *Haplophilus grenadae* Chamberlin, 1912, (Note A), unexpectedly has been clarified, first through discovery of the holotype, secondly through the recent collection of a second specimen. The type was eventually located in the collection of the Museum of Comparative Zoology at Harvard University, and the second known specimen was found among an unidentified assortment of Arkansan Chilopoda recently received at the National Museum. I wish to express my gratitude to Drs. Darlington, Levi, and Brown of Harvard for their kindness in permitting me to study typical material in their charge, and to extend my thanks to Nell B. Causey of Fayetteville, Arkansas, for her generous donation of the Arkansan specimens.

If we distinguish generically between the European and North African forms now referred to *Stigmatogaster*, and the American forms which Chamberlin has placed in his *Stenophilus*, then, proceeding on the basis of the fragmentary evidence at hand, we are drawn to the conclusion that *grenadae* evidently appears to belong to *Stenophilus*. It would be difficult to discount as unreasonable the possibility that in *Stigmatogaster* (*sensu lato*) we are dealing with a single, very widely distributed, internally labile, and monophyletic assemblage. Conceivably, future studies could reveal *Stigmatogaster* to be like *Geophilus*, widespread and com-

prised of numerous species between which, or between groups of which, there are pronounced gaps in many cases. But no one is in a position to approach a confident resolution of these problems yet; hence the more conservative and provisionally the best course seems to be to follow Chamberlin in separating the Old from the New World species generically on existing criteria. Indeed, it may well be that this is actually the correct solution, although the evidence now confronting us surely seems inadequate to permit a definite decision pro or con.

Chamberlin (1953: 37) says: "*Stenophilus* as far as now known differs from the European genera mentioned in lacking conspicuously sclerotic or chitinous lines on the prosternum and in lacking *all* paratergites [my italics]." Both in *Meinertophilus* and *Stigmatogaster* nearly all species have pronounced prosternal sclerotic lines, and although *major* paratergites are totally lacking in both genera, *intercalary* paratergites are present and variously developed in both. (Note B.) We must assume, then, that when Chamberlin reports the *Stenophilus* species to lack "all paratergites," he means they lack both *major* and *developed intercalary* paratergites. This alone, so far as I can learn from the literature, appears to be the chief key character that will distinguish *Stenophilus* from *Stigmatogaster* and *Meinertophilus*. The *prosternal* character is probably of secondary significance.

On the basis of the information given in Chamberlin's writings, the following characters *in combination* should characterize only *Stenophilus* as it is now known: 1) prosternal sclerotic lines absent; 2) major and intercalary paratergites absent; 3) ventral porefields (a) absent, or (b) present only on anterior sternites, or (c) present on all or nearly all pedal sternites; 4) parasternal pits present at least in some species (*coloradanus* and *grenadae*). The following key to species is based almost wholly upon Chamberlin's published data, which in turn are drawn only from the typical specimens. It is therefore admittedly preliminary and probably unsatisfactory; nonetheless, it is presented in the hope that it may assist in the recognition of some or all of the species of *Stenophilus* now known from North America.

North American Species of *Stenophilus*

- | | |
|---|---|
| 1a. Ventral porefields absent | 2 |
| b. Ventral porefields present | 3 |
| 2a. Labral teeth large, broad, about 13 in number; occupying about a third of each labral side (see 1946, p. 37, Fig. 3). Female holotype with 77 pairs of legs, 38 mm long. (Colorado) | |
| <i>coloradanus</i> Chamberlin (1946: 35) | |
| b. Labral teeth smaller and more pointed, about 8 in number; occupying about half of each labral side (see 1930, p. 298, Fig. 2). Male holotype with 97 pairs of legs, 90 mm long. (California) | |
| <i>californicus</i> (Chamberlin) (1930: 298) | |
| 3a. Ventral porefields present only on anterior half of body. (Oregon) | |
| <i>rothi</i> Chamberlin (1953: 38) | |

- b. Ventral porefields present on sternites of anterior as well as of posterior parts of body 4
- 4a. The flexed prehensors nearly reaching level of front of head. Tergites not bisulcate. Anterior spiracles vertically narrowly elliptical. Ultimate leg distotarsus about as long as the proximotarsus. (Idaho) *audacior* (Chamberlin) (1909: 177)
- b. The flexed prehensors falling far short of level of front of head, reaching as far forward as level of labrum. Tergites distinctly bisulcate. Anterior spiracles circular. Ultimate leg distotarsus conspicuously longer than the proximotarsus. (Mississippi, Arkansas) *grenadae* (Chamberlin) (1912: 435)

The following description is based upon the Arkansas specimen, which, when compared directly with the holotype, was found to agree minutely with it in all significant particulars. The second specimen, rather than the holotype, is described in considerable detail here because the condition of the latter is sufficiently poor as to obscure many microscopic details that may prove to be meaningful in the future. The original description of 1912 is accompanied by four figures to which the reader's attention is directed.

Fig. 11 depicts the peculiarly long ultimate distotarsus well, although it fails to show the ultimate presternite which covers the antero-lateral corners of the sternite proper. Neither does it show the biarticulate female gonopods nor the penultimate sternite's porefield. Fig. 13 is a good representation of the head and antennae, but note that the antennae appear to be quite attenuate distally when contracted. In the Arkansan specimen, on the other hand they appear less attenuate, indeed nearly non-attenuate, owing to the fact that their articles are extended. Fig. 10 shows very clearly how short and robust the prehensors are; note that they reach the level of the labrum. The same figure, however, is misleading in that it suggests the right subcondylic sclerotic line to be present; these lines are present neither in the holotype nor in the Arkansan specimen. These figures are augmented by those I have prepared of the clypeus, labrum, maxillae, mandible, and prehensor.

Stenophilus grenadae (Chamberlin)

Haplophilus grenadae Chamberlin, Bull. Mus. Comp. Zool. Harvard, 54(13): 435, (1912). [Grenada, Mississippi.]

Stigmatogaster grenadae (Chamberlin),—Attems, Das Tierreich, Lief. 52: 42, (1929). [Note *lapsus calami*, "Grenada, Misiones."]

Haplophilus grenadae Chamberlin,—Crabill, Ent. News, 70(6): 157, (1959). [Incertain sedis.]

Female: ARKANSAS: Pulaski County, Little Rock. April, 1953. B. Johnson, leg. Transmitted by N. B. Causey. In U. S. National Museum collection of Chilopoda.

Introductory: Length 20 mm. Pedal segments, 65. Color: brownish-yellow throughout; head and antennae lighter, rear third of body some-

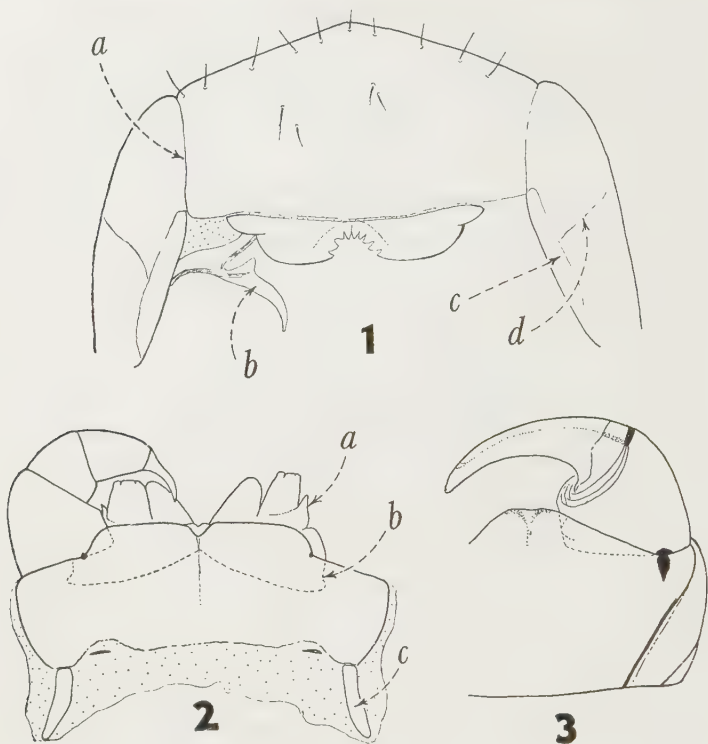


FIG. 1-3

what darker. Body shape: slender; slightly attenuate anteriorly, more strongly attenuate posteriorly. Setae in general are short and sparse.

Antennae (extended in Hoyer's mountant): Length 0.9 mm, head length to antennal length = 1 : 2.3. The two opposing basal articles not contiguous. Each antenna basally very slightly flattened dorso-ventrally; the whole antenna slightly attenuate distally. Articles 1-13 each much wider than long, article 14 is conical and longer than preceding two articles taken together. Ventral vestiture: articles 1-7 very sparsely to moderately sparsely setose; articles 8-14 moderately densely to densely setose. Special sensilla: ultimate article with an outer and an inner elongate patch of short, broad and hyaline, modified setae.

Cephalic plate: Greatest length 0.39 mm, greatest width 0.47 mm, hence much wider than long. Anteriorly rostrate; sides evenly excurved; rear margin straight and slightly overlapping anterior margin of basal plate (prebasal plate thus concealed). Frontal suture absent; no other sulci detected.

Clypeus (Fig. 1): Paraclypeal sutures complete but poorly defined.

Without clypeal areas; with a very weak plagula just anterior to each labral sidepiece. Setae: extreme anterior margin of clypeus with a line of some 5 setae on each side; midclypeal setae, left 2, right 1; posterior geminate (prelabral) setae absent. Bucca: each with 2 antero-ventral setae; transbuccal suture on each bucca very weakly indicated; anterior inner margin strongly sclerotized.

Labrum (Fig. 1): Completely separated from the clypeus by a narrow suture. Completely divided centrally into right and left halves, the whole labrum deeply embayed across its central portion. Each labral half with distinct teeth, 4 or 5 on each half.

First maxillae (Fig. 2): Coxosternum nearly divided in two by a deep central cleft, the coxosternum virtually concealed by the second maxillary coxosternum. Telopodite not perceptibly bipartite. Coxosternal lappets absent; telopodite lappets short, pointed, non-squamulate.

Second maxillae (Fig. 2): Coxosternum antero-medially deeply diastemate, the diastema continuous with a shallow midlongitudinal sulcus. Postmaxillary sclerites atypical, each apparently represented by a minute, vague, bar-like extension of the maxillary postero-lateral corner. Telopodite: 1st article basally bicondylic and very wide; terminal claw very long, distally slightly bent, its under (posterior) surface slightly excavate, its edges smooth, not pectinate, basal bristles (spines) not detected.¹

Mandible: Axes of dentate lamella and of adjacent pectinate lamellae nearly parallel. Dentate lamella with some 6 strongly sclerotized and 2 nearly hyaline teeth. With 3 pectinate lamellae, these followed by what appears to be a row of simple teeth (incipient pectinate lamellae?, artifacts?).

Prosternum: Without subcondylic sclerotic lines (chitin lines of authors) passing toward or connecting with condyles.

Prehensors: When flexed, attaining level of labrum, falling far short of front of head. Basal article very broad; intermediate articles greatly reduced in size. No denticles detected. Ungula very long and robust, its concave surface concealed from ventral view; both edges smooth, not serrulate or noticeably dissected. Poison calyx weakly developed, long, the digitiform appendices relatively few. Poison gland difficult to trace but apparently very long, passing out of the trochanteroprefemur and deeply into the prosternal segment.

Tergites: Paramedial longitudinal sutures present and conspicuous.

Pleurites: Major paratergites wholly absent. Intercalary paratergites absent, i.e. the lateral ends of the intercalary tergites (pretergites) merge with membrane without forming plates; intercalary tergite lateral ends concealed beneath the large, overlapping dorsal extensions of the intercalary pleurites. Spiracles all round. The last stigmopleurites separated by sutures from the associated tergite.

Legs: First pair slightly shorter than the second. Approximately the first 35 pairs are extremely robust and short, thereafter legs becoming

¹In this specimen the claw is flexed such that if basal bristles were present, they would be concealed; they may, nevertheless, be present.

somewhat longer and thinner. Pretarsi very robust and long, at least half as long as associated tarsus. Pretarsal accessory spurs about $\frac{1}{4}$ as long as claw proper and approximately equal in length to each other.

Sternites: Approximately the first 40 sternites each distinctly wider than long, thereafter becoming longer than wide, eventually much longer than wide. Sulci, depressions, etc. either absent or else too weak to be detected. Porefields of pro- and metacoxal pleurites absent. Antero-lateral sternal porefields absent. Posterior sternal porefields: on sternites from and including 1 through about 40 each is postero-marginal and either transversely subelliptical or transversely subreniform, thereafter porefields become progressively small, nearly subcircular, and move to a position just posterior to central, those of the 5 or 6 sternites preceding the ultimate sternite are slightly larger again. Sternites 26-33 each flanked on each side by 2 prominent, subelliptical to subcircular parasternal pits.

Ultimate pedal segment: Pretergite separated from its pleurites on each side by a distinct suture (or fold?). Tergite wider than long; sides slightly convergent posteriorly; rear margin essentially straight, the corners rounded. Presternite very large and distinctly divided centrally; passing obliquely postero-laterally to cover corners of sternite proper. Sternite slightly longer than width at midlength; sides very slightly bowed outward and slightly convergent; posterior margin essentially straight. Each coxopleuron (seen from below) extending somewhat forward of rear margin of penultimate sternite rear margin; pores numbering between 25 and 35, these distributed dorsally, ventrally and sparsely laterally; the whole structure moderately inflated. Legs slightly longer than penults; each with a tarsus of two articles, the distotarsus notably longer than the proximotarsus; pretarsus totally absent.

Postpedal segments: Female gonopods basally contiguous but not fused; each weakly biarticulate, the distal article only slightly smaller than the proximal. Terminal pores absent.

NOTE A

Since the history and present status of *Haplophilus* are somewhat confusing, some clarification is in order. *Haplophilus* was proposed in 1896 (p. 6) by O. F. Cook, who, curiously enough, buried it in the middle of an article on diplopod nomenclature. He explained that it was proposed to replace *Haplogaster* Verhoeff, 1896, which was preoccupied at least twice: by *Haplogaster* Chaudoir, 1879, for a carabid; by *Haplogaster* Kolbe, 1894, for a cerambycid. At the time of proposal Cook mentioned no inclusive species by name, but he did make perfectly clear his intention, and he did refer to the Verhoeff name whose type-species (by monotypy) was *Himantarium dimidiatum* Meinert, 1870. The same species, then, automatically became the type-species of *Haplophilus*, since if a generic name without originally designated type-species is proposed to replace another generic name with or without type-species, the type-species of either, when established, becomes *ipso facto* the type-species of

the other. Therefore the type-species of *Haplophilus* Cook, 1896, is *Himantarium dimidiatum* Meinert, 1870 (= *Stigmatogaster dimidiata* (Meinert) *sensu* Attems, 1929: 40).

In the two most important revisions of the family that have appeared to date the status of *Haplophilus* has been interpreted somewhat differently. In 1909 Chalande and Ribaut regarded *Stigmatogaster* and *Haplophilus* as closely related but separate genera. Those species with freely opening coxopleural pores were referred to *Haplophilus*, whereas species with dorsal porigerous pits were placed in *Stigmatogaster*. In 1929 Attems united the genera, placing *Haplophilus* in synonymy beneath the senior name, *Stigmatogaster*. This solution involves certain difficulties too, but since a satisfactory resolution seems remote at this time, it is best to follow his system.

NOTE B

The distinction between major and intercalary paratergites must be clearly understood. A major paratergite is an elongate plate, a pleurite, which lies between the stigmopleurite and the associated major tergite. An intercalary paratergite is its serial homologue, differing from it notably in at least two important respects. (1) In position: The intercalary paratergite is associated with the intercalary tergite (morphologically the pretergite) and lies just lateral to each of its lateral ends. The intercalary paratergite may be single or subdivided, obscure, or very conspicuous. (2) In size: The intercalary paratergite is always much smaller than the major paratergite; indeed, in many species it can be quite difficult to find. An excellent, illustrated discussion of paratergites is given by Chalande and Ribaut (1909: 216-220).

EXPLANATION OF FIGURES OF *STENOPHILUS GRENADAE* (CHAMBERLIN)

Fig. 1.—Clypeus, labrum, buccae. (Ventral aspect: setae shown.) a = right paraclypeal suture. b = posterior arm of labral fultura. c = more heavily sclerotized border of left bucca. d = imaginary line separating weakly sclerotized upper portion of left bucca from its more heavily sclerotized lower portion.

Fig. 2.—First and second maxillae. (Ventral aspect: setae deleted.) a = small but distinct lappet of first maxillary left telopodite. b = dashed line: outline of concealed lower edge of first maxillary coxosternum. c = obscure, hyaline, detached extension of second maxillary coxosternum; presumably a vestigial postmaxillary sclerite.

Fig. 3.—Prosternum and left prehensor. (Ventral aspect: setae deleted.) Tarsungula strongly flexed and tilted slightly toward the observer.

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PROCEEDINGS
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OCTOLASMIS DAWSONI, NEW SPECIES (CIRRIPIEDIA:
LEPADIDAE) FROM *BATHYNOMUS GIGANTEUS*

BY DAVID CAUSEY

University of Arkansas and Gulf Coast Research Laboratory

The barnacle described here was encountered while studying the genus *Octolasmis* in the Gulf of Mexico. It was first called to my attention by C. E. Dawson, Marine Biologist of the Gulf Coast Research Laboratory, being upon a specimen of the huge, deep water isopod *Bathynomus giganteus* Milne-Edwards in the collection of that institution. It was also present upon a large number of specimens of the same host sent to me by Harvey R. Bullis, Jr., Fish and Wildlife Service, Pascagoula, Mississippi. I am much indebted to Mr. Dawson, after whom the species is named, and to Mr. Bullis for the specimens.

A survey of the species of the genus *Octolasmis* in the Gulf of Mexico will appear elsewhere.

***Octolasmis dawsoni*, new species**

Figs. 1-6

Holotype: A specimen with well-developed ovaries; southeast of Pensacola, Florida, lat. 28° 30' N, long. 86° 11' W, 240 fathoms; collected by the Fish and Wildlife Service, M/V "Oregon," 11 March 1955; U. S. Nat. Mus. Cat. No. 104378.

Paratypes: Several specimens, same data as holotype, all from a single host specimen. Many specimens from numerous host specimens; south of the Dry Tortugas, 24° 11' N, long. 83° 21.5' W, 400 fathoms; collected by the Fish and Wildlife Service, M/V "Silver Bay" 8 June 1959. No specimens are fully mature, i.e., with eggs or nauplius larvae.

Diagnosis: Similar to *Octolasmis lowei* (Darwin, 1851), from which it is distinguished superficially by its smaller size, the brown color, and the apically notched tergum.

Description: The tergum of *O. dawsoni* (Fig. 2) is notched apically, and the umbo is almost centrally placed in young specimens and sub-terminal in more mature specimens. Fully matured specimens have not been encountered. In *O. lowei* the apical end is rounded and the small umbo is distinctly terminal (Fig. 1).

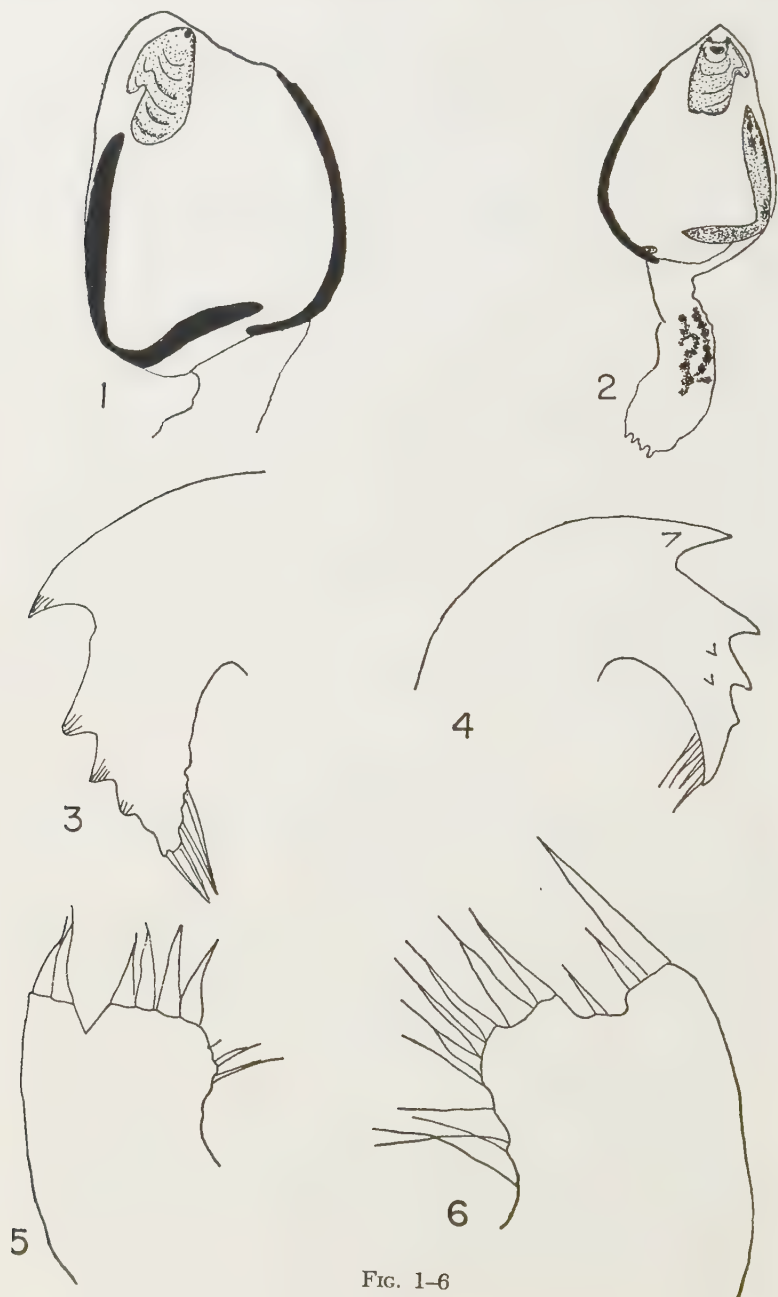


FIG. 1-6

The scutum and the carina do not offer any details of systematic importance, nor does the length of the peduncle. These features are generally emphasized in the description of species in this genus, but they seem based upon the examination of too few specimens. The mandibles (Fig. 4) have either 3 or 4 teeth (I think according to the maturity of the specimen), and apparently the teeth do not have ridges upon them. The mandibles of *O. lowei* (Fig. 3) have 4 teeth (the terminal point is not usually considered a tooth), and the teeth have ridges upon them that are brought out in KOH preparations. In KOH treated specimens, *O. dawsoni* shows hooks at the base of the teeth and *O. lowei* does not. These may be cuticular processes of the body surface in the vicinity of the mandibles. Various patterns of such hooks are present in other species of the genus and may be of specific value. The maxilla of *O. lowei* (Fig. 5) has the customary notch, with relatively few bristles or setae; *O. dawsoni* (Fig. 6) has a broader notch and more bristles or setae. The penis does not appear to be of taxonomic significance.

Size: Measurement of the length of the capitulum of the first 10 specimens encountered (for this purpose) gave an average length of 1.42 mm, with the range between 1 mm and 2 mm. For *O. lowei* a similar 10 specimens gave an average length of 2.39 mm, with the range between 1 mm and 3 mm. Possibly more mature specimens of *O. dawsoni* would approach the dimensions of *O. lowei*.

Ecology: This barnacle has been collected only from the ventral surface of the abdomen of a single host species.

Summary of the characters that distinguish O. dawsoni and O. lowei:

<i>O. dawsoni</i>	<i>O. lowei</i>
Living in deep water of Gulf of Mexico on <i>Bathynomus giganteus</i> .	Living in shallow water on <i>Callinectes</i> , <i>Libinia</i> , <i>Portunus</i> , and <i>Calappa</i> ; cosmopolitan.
Attached to the ventral surface of the abdomen of the host.	Attached to the gills and the branchial cavity of the host.
Average length of capitulum 1.42 mm.	Average length of capitulum 2.39 mm.
Light brown, almost salmon colored.	Cream colored.
Tergum notched apically.	Apex of tergum rounded.
Umbo almost centrally placed in young specimens and subterminal in more mature specimens.	Umbo smaller and terminal.
Mandibles with 3 or 4 teeth, without ridges, with hooks at base of teeth.	Mandibles with 4 teeth, with ridges on teeth, without hooks at base of teeth.
Maxilla with broad notch and more bristles or setae than in <i>O. lowei</i> .	Maxilla with notch and few bristles or setae.

LITERATURE CITED

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EXPLANATION OF FIGURES

All figures are camera lucida outlines from KOH preparations mounted in Permount. The exact number of bristles or setae is problematical in such preparations.

- Fig. 1.—*O. lowei*, whole specimen.
Fig. 2.—*O. dawsoni*, whole specimen.
Fig. 3.—*O. lowei*, mandible.
Fig. 4.—*O. dawsoni*, mandible.
Fig. 5.—*O. lowei*, maxilla.
Fig. 6.—*O. dawsoni*, maxilla.

PROCEEDINGS
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A NEW MARINE CENTIPEDE FROM THE CALIFORNIA
LITTORAL

BY RALPH V. CHAMBERLIN

Through the courtesy of Prof. J. W. Hedgpeth, director of the Pacific Marine Station, California, I have been able to examine specimens of the new geophilid centipede here described. This new form is of special interest because of its occurrence under stones between the tide levels near Dillon Beach. It represents a new genus in the family Schendylidae to which several forms of known or probable littoral habitats pertain. However, centipeds of such occurrence are not restricted to this family. Thus the most commonly found of all marine centipeds is *Linotaenia maritima* (Leach) of the European coasts and on the coast of Alaska the author has reported the occurrence of *Brachygeophilus admirinus* Chamberlin, near the lower tide mark, these two species belonging respectively to the Linotaeniidae and the Geophilidae.

In the family Schendylidae long known as a marine centipede is *Hydroschendyla submarina* (Grube), found in the littoral of England, Ireland, and the Bermuda Islands, as well as along the continental coast from Sweden to France. A related genus, *Haplophilus*, has in the Mediterranean area a form of known littoral habits, this being *H. dimidiatus angustus* (Latzel). In the western Atlantic another related genus, *Bimindyla*, is represented by a species *B. gertschi* Chamberlin which is suspected to have similar habits. On the American Pacific coast another related genus, *Pectiniunguis*, is represented in the littoral fauna of Mexico and the Galapagos Islands, and the genus *Thindyla*, allied to the preceding, by a species described by the author from Callao, Peru.

The following tabulation will aid in placing the new genus with reference to these and some other related genera of the Schendylidae.

1. Last coxae with 0 or at most 1 or 2 glands or pores 2
 Last coxae with from 4 or 5 to many pores 8
2. Last coxae with no glands or pores 3
 Last coxae with 1 or 2 pores 5
3. Labrum bearing stout teeth over middle
 portion *Nesonyx* Chamberlin
 Not so, the median part with margin simply undulate or at most
 crenate 4
4. Labrum deeply incurved or excavated at
 middle *Haploschendyla* Verhoeff
 Not so, the labral margin gently concave or nearly
 transverse *Bimindyla* Chamberlin
5. Coxal glands simple or homogeneous 6
 Coxal glands compound or heterogeneous 7
6. Anal legs with a stout claw; middle of labrum with stout
 teeth *Nyctunguis* Chamberlin
 Anal legs with no claw; labrum deeply incurved at middle,
 without true teeth *Hydroschendyla* Brol. and Ribaut
7. Labrum without true teeth at middle, at most
 crenate *Thindyla* Chamberlin
 Labrum with stout teeth at middle, not deeply
 incurved *Pectiniunguis* Bollman
8. Claw of palpus of second maxillae closely pectinate *Escaryus* Cook
 This claw entirely smooth 9
9. Prehensors small, not attaining front margin of head; femuroid
 and prosternum without teeth *Lionyx*, gen. nov.
 Prehensors exposed from above, exceeding the head anteriorly;
 femuroid and prosternum bearing teeth 10
10. Anal legs with a claw; coxal pores small and
 numerous *Apunguis* Chamberlin
 Anal legs lacking a claw; coxal pores only 4 or 5,
 larger *Sogolabis* Chamberlin

***Lionyx*, new genus**

In general close in structure to *Escaryus* but differing in having the claw of the second maxillae entirely smooth instead of closely pectinate. In the first maxillae the palpus bears a sensory lappet but none occurs on the basal joint of the maxilla proper. The labrum bearing a series of numerous long spines but no true conical teeth, although the spines are abruptly thicker at where they tend to fuse transversely. No ventral pores detected. Last ventral plate broad, coxal pores typically 5 on each side, the glands simple. Anal legs with a normally developed claw, crassate in the male.

Type species: Lionyx hedgpethi new species

***Lionyx hedgpethi*, new species**

Figs. 1 and 2

Color pale yellow.

Head about three fourths as wide as long, widest a little back of mid-

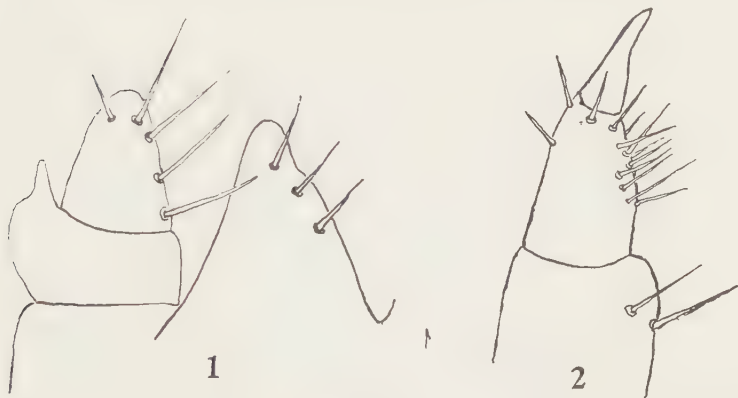


FIG. 1-2

dle; with no frontal suture. Antennae long and filiform. The labrum free, evenly concave, armed with numerous processes which are spiniform and separated above their bases which are contiguous. First maxillae with a stout palpus which bears on its first joint a sensory lappet. (See Fig. 1.) The second maxillae with coxal plate without suture or division at middle; palpus bearing a large claw which is entirely smooth. (See Fig. 2.)

Claws of prehensors when closed failing much of attaining the anterior margin of the head. Femuroid of prehensors unarmed, but the claw with a denticle at base. Prosternum unarmed anteriorly; no sclerotic lines obvious.

The relatively large clypeal area finely and uniformly areolate, with no clear non-areolate areas; setae near lateral borders but none detected in middle portion.

Sternites smooth, sparsely setose. In anterior part the sternites have the anterior margin of each sclerotized into an edge below which a similar edge of the preceding sternite seems to fit when the animal coils.

Last ventral plate or sternite broader than long, narrowed caudad, trapeziform. Coxal pores typically 5 on each side; the two innermost of these pores adjacent to or partly covered by the sternite. Anal legs in the male crassate; claw large and smooth.

Pairs of legs 49.

Length: 20 to 25 mm.

Locality: California, near Dillon Beach, Marin Co.; Nick's Cove, Tomales Bay. Type taken 8 July 1959 by J. W. Hedgpeth and students.

EXPLANATION OF FIGURES

Lionyx hedgpethi new species. Fig. 1.—A first maxilla. Fig. 2.—Distal portion of palpus of second maxilla.

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A NEW SUBSPECIES OF *LEIOCEPHALUS*
STICTIGASTER SCHWARTZ FROM CENTRAL CUBA

BY ALBERT SCHWARTZ

Department of Biology, Albright College, Reading, Pa.

I (1959) have recently described the species *Leiocephalus stictigaster* from western Cuba and the Isla de Pinos. At the time of this description, I mentioned (op. cit.:110) two lizards from Bayamo, Oriente, which were tentatively considered to represent *L. cubensis cubensis*, despite the fact that these two individuals agreed rather well with my concept of *L. stictigaster*. The occurrence of this species as far east as Oriente left a distributional hiatus of considerable extent, since the easternmost Cuban record was in central Pinar del Río Province.

In the summer of 1959, in the company of Ronald F. Klinckowski and Barton L. Smith, I collected on the north coast of Camagüey Province, at Playa Santa Lucía; this locality lies between the Bahía de Nuevitas on the west and the Oriente border on the east. At this locality we took a long series of *L. stictigaster*. Although both *L. carinatus* and *L. macropus* occur at Playa Santa Lucía, *stictigaster* is the most common of the three and is the only member of the genus which occurs along the beach itself. This locality lies within the known range of *L. c. cubensis* (see map, op. cit.:99), although we took no specimens of *cubensis* near Santa Lucía. In addition to our series, I have been permitted to examine a number of these lizards taken at Santa Lucía by Ernest E. Williams and Rudolfo Ruibal. Their collection also includes a single individual from the serpentine savanna ca. 20 kilometers north of Camagüey city. Although this lizard appears distinct from the Playa Santa Lucía lot, it agrees well with the two specimens previously reported from Bayamo. Additional material from eastern Camagüey and western Oriente will undoubtedly show

that another race of *stictigaster* inhabits that area. The lizards from Playa Santa Lucía are distinct from the remaining four races of *L. stictigaster*, and for them I propose the name

***Leiocephalus stictigaster lucianus*, new subspecies**

Type: American Museum of Natural History (AMNH) 83583, an adult male, from Playa Santa Lucía, Camagüey Province, Cuba, taken 30 June 1959 by Ronald F. Klinikowski. Original number 7298.

Paratypes: AMNH 83554–82, same locality as type, 29 June 1959, R. F. Klinikowski, A. Schwartz, B. L. Smith; Museum of Comparative Zoology (MCZ) 59211–28, (Playa) Santa Lucía, east of Bahía de Nuevitas, Camagüey Province, Cuba, 24 August 1959, E. E. Williams, R. Molina, R. Ruibal.

Diagnosis: A subspecies of *Leiocephalus stictigaster* characterized by broad white to tan dorsolateral stripes, dorsal pattern prominently and contrastingly lined longitudinally, the dark dorsal colors ranging from dull tans to brown and black, brown to orange ventral dots on a white to pale yellow ground, and a distinct and persistent black throat pattern on a clear background.

Distribution: Known only from the type locality.

Description of type: An adult male with the following measurements (in mm) and counts: snout–vent length 76, tail (distal quarter regenerated) 119, snout to anterior border of tympanic opening 16.5, head width 13.8, supraocular scales 6/6, loreals 6, temporals 11, enlarged auricular scales 3/4, median head scales 4, prefrontal row complete 3 scales, frontoparietal row complete 5 scales, parietals in contact, semicircles complete, dorsal crest scales occiput to vent 53, dorsal crest scales occiput to axilla 24, scales around one half of body at midbody 23, fourth toe subdigital tricarinate scales 23/24.

Coloration of type: The dorsal coloration of the type is generally dull to darker tan, the pigments arranged in the typical zoned pattern of *stictigaster*, as follows: Zone 1 is brown and confined to the median crest scales. Laterally, zone 2 is dull tan and rather sharply set off from zone 3, the dorsolateral fields, which are brown with scattered darker brown scales. The dorsolateral fields are again sharply differentiated from zone 4, which is wide and very pale tan, and extends from the posterior edge of the temporals to the proximal portion of the tail, becoming less prominent above hindlimbs. Zone 5 is a rich dark brown, much more saturated than the brown of zone 3; it begins posterior to the eye and continues posterior to the hind limb insertion. There appear to be some longitudinal black dashes in zone 5, but because of the depth of the pigmentation of the ground color, these dashes are not well defined. Zone 6 is white, beginning below the eye and proceeding posterior to the groin; both dorsally and ventrally zone 6 is delimited by irregular black to dark brown markings, which set the zone off from the pigmented areas above and below it. Below zone 6 is an additional longitudinal zone, between the fore and hind limbs, which is brown with scattered black dashes; this lowermost

zone changes rather abruptly to the whitish venter. The dorsal surface of the head is tan with black dots on the snout, the supraocular semicircles, and the posterior head shields. The postorbital blotch is absent, the temporal region having the same brown pigmentation as zone 5, although in the postorbital region the ground color is somewhat lighter and dorsal and ventral black margins of zone 5 are more pronounced than elsewhere. The dorsal surfaces of the limbs are medium tan, spotted with a lighter tan, which is more prominent on the hind limbs than on the fore limbs. The hind limbs also show dark brown dashes on their dorsal surfaces. The dorsal surface of the tail has about ten indistinct chevrons, the more proximal ones being almost obliterated and their position marked only by paired dark brown dots on the tan caudal ground color. The throat is boldly marked on a clear pale yellow ground; there are two black V's, their apices pointed anteriorly, the second of which is incomplete at the midline, and both of which are preceded by a small black bar. Posterior to these are a pair of paramedian black lines which extend onto the chest. The chest itself is marked with black spots and these spots occur as well on the underside of the fore limbs. The remainder of the venter is marked with dark brown (centrally) to orange (peripherally) dots, which may even appear as longitudinally elongate dashes, and which extend as well onto the underside of the thighs and onto the sides of the tail. The underside of the shank is dull white and lacks well-defined spots.

Variation: In snout-vent length, 20 males (type and paratypes) average 63.9 (52-78), 23 female paratypes average 50.3 (41-58). Dorsal crest scales in occiput-vent length (combined data for both sexes) average 51.6 (45-56) and dorsal crest scales in occiput-axilla length average 22.0 (18-29). One half scales are midbody average 23.8 (21-27), loreals 4.9 (3-8), temporals 11.4 (9-14), subdigital tricarinate scales on the fourth toe 24.3 (21-27). The parietals are more often in contact (73%) than not, the supraorbital semicircles are more often complete (72%) than not. All specimens have four median head scales, three prefrontal scales in a complete row, and usually five frontoparietals in a complete row, although counts of four and six occur as well, and two individuals have the frontoparietal row interrupted.

The paratypes include 22 males, of which three are juveniles (snout-vent lengths 37 to 44). All adult and subadult males agree well with the type in coloration and pattern, although some are even more darkly pigmented. The lateral fields often have more prominent black dashes than those of the type, and the dorsal fields at times show more dark blotches than does the type. The postorbital blotch is consistently absent, and the dorsum is always prominently lined, the pale zone 4 involving parts of three scales (one entire scale and halves of two adjacent scales). The ventral ground color ranges in life from white to pale yellow. The throat pattern is essentially that described for the type, but it may show some fragmentation which is not extensive. The most anterior of the throat V's may be preceded by a small transverse black bar, the paramedian lines may be joined to the more posterior of the V's, there may be an additional

pair of paramedian lines adjacent to the central pair; all these variations do not disturb the inherently obvious pattern of the throat. All have the venter dotted with brown, although the three juveniles lack the dots centrally, but have them peripherally. The dorsal surfaces of the hind limbs usually show both tan and dark brown markings, but one or both features may be absent, so that this member may have an unmarked dorsal surface.

Aside from their smaller size, the females present no special features. They resemble the males in all characteristics, even to the throat pattern and heavily spotted venters, although juvenile females, like juvenile males, have few to no dots centrally on the belly.

Comparisons: *L. s. lucianus* differs from the races *stictigaster*, *sierrae* and *exotheotus* by virtue of its dorsal pattern; in these three subspecies, zone 4 regularly involves one and one-half scales, in contrast to three scales in *lucianus*. In addition, *lucianus* has a definite throat pattern and ventral dots; *exotheotus* may lack ventral dots, and all three western races usually have the throat pattern disintegrated in adults and have some gray clouding on the ground color. *L. s. lucianus* most closely resembles *astictus* dorsally; both have a wide zone 4. However, *astictus* lacks ventral dots, has the parietals usually (73%) not in contact, and has red sides with green dots, whereas *lucianus* has brown sides without other lateral chromatic markings.

Remarks: *L. s. lucianus* is known to occur only along the sandy beach at Playa Santa Lucía; in this area it is the most abundant lizard and large numbers were seen daily. That the species does not occur only at this single isolated locality is shown by one specimen (MCZ 59229) from about 20 kilometers north of Camagüey. I hesitate to call this single lizard *lucianus*, since it appears to be distinctively colored dorsally, has especially heavy dark throat markings, a narrow zone 4, and rather prominent dark markings in the lateral fields. In all these characteristics this specimen agrees well with the two Bayamo lizards referred to previously. It is probable that *L. stictigaster* has a much wider distribution in eastern Cuba than is currently known, and it should be looked for at least in Camagüey and western Oriente.

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PROCEEDINGS
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NOTES ON SOME NORTH AMERICAN TEPHRITIDAE,
WITH DESCRIPTIONS OF TWO NEW GENERA
AND TWO NEW SPECIES
(DIPTERA)

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This paper comprises some notes and descriptions accumulated during a compilation of a definitive catalog of North American Tephritidae. Included are the descriptions of *Metatephritis fenestrata*, n. gen., n. sp.; the genus *Mylogymnocaena*, n. gen., for *Urellia apicata* Thomas; and *Gymnocarena bicolor*, n. sp. *Eutreta aurantiaca* Doane is placed in the genus *Xenochaeta*; a first United States record for *Acrotaenia testudinea* (Lw.) is given; and the genera *Gymnocarena*, *Oedicaena*, and *Zonosemata* are discussed.

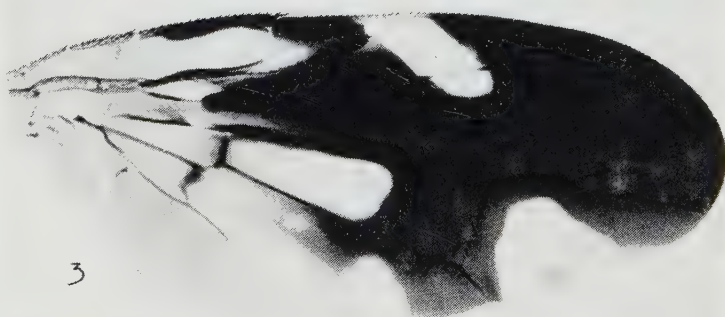
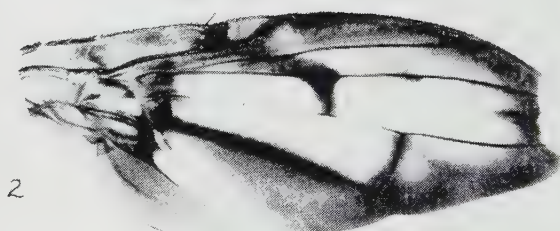
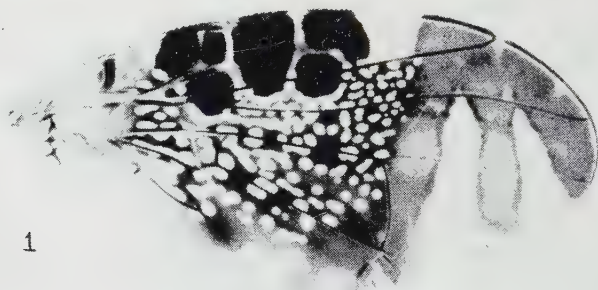
Assistance was received from M. T. James, Washington State University, Pullman; R. B. Lattimore and E. W. Jackson, U. S. Department of Agriculture, Brownsville, Texas; C. W. Sabrosky, U. S. Department of Agriculture, Washington, D. C.; and H. V. Weems, Jr., State Plant Board of Florida, Gainesville. The collections of the Museum of Comparative Zoology, Cambridge, Massachusetts, and the U. S. National Museum were indispensable.

Acrotaenia testudinea (Loew)

(Fig. 1)

Trypeta testudinea Loew, 1873, Smiths. Misc. Coll. 11(256): 272; pl. XI, Fig. 13.

Acrotaenia testudinea: Loew, 1873, Smiths. Misc. Coll. 11(256): 274.—Hendel, 1914, Abh. u. Ber. Anthrop.-Ethn. Mus. Dresden (1912) 14: 59.—Bates, 1933, Bull. Brooklyn Ent. Soc. 28: 164.—Bates, 1934, Rev. de Ent. 4: 9.—Aczél, 1949, Acta Zool. Lilloana 7: 269.



FIGS. 1-3

A female of this species was collected 26 January 1936, on Big Pine Key, Monroe Co., Florida, by T. J. Cooper in a glass McPhail fruit fly trap. The specimen has been assigned Florida State Plant Board Acces-

sion No. 58178 and is deposited in the collection of that organization at Gainesville. This constitutes the first United States record of the genus and species, and is the only one known to me. It is significant that this fruit fly has never been recorded from the United States since 1936 despite the large number of traps used in the extensive Florida fruit fly survey conducted during and after the 1956-1957 Medfly outbreak.

The type locality of *testudinea* is stated by Loew (1873) as Cuba; the specimen is in the Berlin Museum. The species has been reported from Cuba and Puerto Rico several times, and specimens in the U. S. National Museum represent several localities on each of these islands. The National Museum also contains a specimen bearing the label "Jacaqua, Dominican Republic."

The wing illustrated in Figure 1 is that of a Puerto Rican female.

Xenochaeta aurantiaca (Doane), new combination

Eutreta aurantiaca Doane, 1899, Jour. New York Ent. Soc. 7: 185; pl. III, Fig. 10.—Aldrich, 1905, Smiths. Misc. Coll. 46(1444): 608.

Tephritis aurantiaca: Coquillett, 1899, Jour. New York Ent. Soc. 7: 264.

Through the courtesy of Maurice T. James, I have been able to examine the holotype of *aurantiaca* Doane. This female is headless and has but one wing, but is otherwise intact. Although the hyaline spots in the wing of *aurantiaca* are smaller, much more discrete, and separated from each other by greater distances than in *dichromata* Snow, the only other species in the genus, the general pattern of spotting, as illustrated by Doane (1899), is similar. Both species have a shiny yellow abdominal dorsum with large, dark, partially or completely confluent spots covered by mixed black and yellow setae; the mesonotum covered by some pollinosity and dense reddish or yellowish hairs; the dorsal one-third of the thoracic pleural area with a light yellow stripe that includes the humerus and prothoracic spiracle; and shining black postscutellum and metathorax. An intact specimen of *aurantiaca* from Fort Lewis, Washington, collected by Paul H. Arnaud, Jr., has a sharply pointed third antennal segment, much more so than in *dichromata*. The arrangement of the three lower fronto-orbitals in both species is distinctive; the anterior two are situated close to each other near the antennal bases, and the posterior one is considerably removed from them and in a transverse line with the anterior pair of uppers. The front at the vertex is very wide. The two species may be distinguished from each other by the following key:

Wing pattern consisting of small, discrete, hyaline spots; one small dark mid-ventral spot on each femur; dark spots fused, or nearly so, on all but basal abdominal tergum; scutellum dark basally and centrally, yellow laterally *aurantiaca* (Doane)

Wing pattern consisting of large, diffuse hyaline spots; only hind femur with one dark mid-ventral spot, remaining femora entirely yellow; dark spots not fused on any but terminal abdom-

inal tergum; scutellum with dark area only at base of each
bristle *dichromata* Snow

The genera *Paracantha* Coquillett, *Eutreta* Loew, *Eurosta* Loew, *Ictericica* Loew, *Xanthomyia* Phillips, *Jamesomyia* Quisenberry, and *Acidogona* Loew belong with *Xenochaeta* in the tribe Ditrichini of the subfamily Tephritinae, as outlined in Hering's (1947) detailed key to the suprageneric groups of the family. These genera are characterized by having a wide frons with the upper fronto-orbitals set well inside the lowers, the dorsocentrals in a transverse line through the supra-alars, the wing pattern consisting essentially of light spots on a dark field, and well-defined marks forming a pattern on a light colored abdominal dorsum. These genera, including *Xenochaeta*, have dark spots on one or more pairs of femora or possess partially or entirely dark femora, and all have yellow postocular bristles. From the first five genera named above, *Xenochaeta* may be distinguished by the very different wing pattern, and from *Ictericica* and *Acidogona* by the much smaller size of its species. *Xanthomyia* and *Jamesomyia* are heavily pollinose species with very stout head hairs; the former genus carries only two pairs of lower fronto-orbitals and has a very broad wing with the hyaline spots of the pattern very differently disposed than those of *Xenochaeta*.

Metatephritis, new genus

Diagnosis: Labellum normal in size and shape, not elongate or geniculate; face somewhat produced anteriorly at oral margin; frons at vertex as wide as one eye; from lateral view, gena less than one-half the maximum eye height; third segment of antenna rounded apically; three pairs well-developed lower fronto-orbitals; two pairs upper fronto-orbitals, the posterior pair very light colored and not convergent; post-oculars pale and blunt. Humerals and supra-alars present; one pair dorsocentrals situated immediately behind suture and distinctly anterior to anterior supra-alars; two pairs scutellars.

Type species: *Metatephritis fenestrata*, new species.

Metatephritis fenestrata, new species

(Fig. 2)

Male: In lateral view head 1.3 times as high as long; frons and proximal half of face flat, meeting at an angle of about 120 degrees; gena narrow, 0.1 to 0.15 times as high as one eye; lower fronto-orbitals strongly curved inwardly; ocellar longer than any other head bristle except inner vertical; genal bristle situated directly under eye; antenna about 0.5 times as long as face, entirely yellow.

Mesonotum yellow with indistinctly margined brown marking occupying a narrow area behind head and extending posteriorly to suture on each side of a central yellowish spot situated immediately anterior to suture, and occupying most of notum from suture to scuto-scutellar suture; scutellum entirely yellow, the posterior bristles crossed; entire

postscutellum and median two-thirds of metathorax brown, this spot with indistinct margins; remainder of thorax, including halter and legs, yellow. Wing pattern as in Fig. 2; vein R_{4+5} and node entirely bare; cell 1st A distally extending into a distinct point; vein r-m distinctly distad of midpoint of cell 1st M_2 .

Abdomen yellow above and below; setae on dorsum of segment I yellow, those on dorsal terga of remaining segments brown; claspers with black apical and subapical teeth, the latter very long and slender; remainder of genitalia yellow.

Wing length: 7 mm.

Female: Not known.

Types: Holotype ♂, North Side, Buffalo Bill Reservoir, near Cody, Wyoming (no further data available). U. S. National Museum No. 64871. Paratypes: 1 ♂, same data as type (USNM); 1 ♂, Boundrant, Wyoming, 13 June 1958, in gall of *Artemisia tridentata* (Fronk) (USNM).

Discussion: The unusual wing pattern sets *fenestrata* apart morphologically from all North American tephritids; the species may be recognized immediately by the brown border completely surrounding the wing field, thereby forming a central hyaline area occupying most of cells R, R_5 , and 1st M_2 .

The genus belongs in the typical tribe of the subfamily Tephritinae, as outlined in Hering's extensive key (1947), but is placed there with difficulty because of the absence of hyaline spots in a dark field. The remaining characters are so like those of *Neotephritis* Hendel and *Euarestoides* Benjamin that the genus would be improperly placed elsewhere in the family. Both *Euarestoides* and *Neotephritis* have been reviewed by Foote (1958 and 1960, respectively).

Mylogymnocarena, new genus

Diagnosis: Frons bare, about as wide as one eye at vertex; in profile gena broad and without well-developed bristles anterior to genal bristle; face retreating, without median carina, oral margin not produced anteriorly; holotype with 4 lower fronto-orbitals on one side, 5 on the other; 2 pairs upper fronto-orbitals, the posterior pair not convergent; postoculars pale; antenna about two-thirds as long as face, third segment rounded apically. Humeral, supra-alar, and presutural present; 1 pair dorsocentrals, in a line drawn between anterior supra-alars; 2 pairs scutellars. Femora without stiff short setae ventrolaterally. Vein r-m situated distinctly apicad of midpoint of cell 1st M_2 ; vein R_{4+5} bristled dorsally.

Type species: *Urellia apicata* Thomas.

Mylogymnocarena apicata (Thomas), new combination

Urellia apicata Thomas, 1914, Canadian Ent. 46: 428; Fig. 35.

The original description of Thomas (1914) places this rare species very well. As far as known, the holotype is the only existing specimen. This female is in the Museum of Comparative Zoology, Cambridge, Mas-

sachusetts, and bears the following labels: "Colo 2277," "Urellia apicata Th.," "Holotype No.," and "Type 7731."

The wing pattern of *apicata* indicates an affinity with *Trupanea*, from which it differs by the presence of setae on vein R_{4+5} , the more posterior position of the dorsocentrals, and the larger number of lower fronto-orbitals. The characters of *apicata* do not allow its placement in any of the known tephritid genera.

Genus *Gymnocarena* Hering

Gymnocarena Hering, 1940, *Siruna* Seva 1: 4.

The genus *Oedicarena* was established by Loew in 1873 (see below) for *tetanops*, n. sp., a yellowish Mexican species with a wing pattern very much like *Rhagoletis basiola* (O.S.) and *Zonosema vittigera* (Coq.) but having a prominent facial carina arising between the bases of the antennae and extending to the oral margin. In 1877 Osten Sacken described *Oedicarena persuasa* from Denver, Colorado, and in 1894 Snow placed his new species *diffusa* in *Oedicarena*. The genus as thus constituted caused considerable confusion among tephritid taxonomists, a situation aggravated by the lack of an adequate generic position for *tricolor* Doane, 1899, originally described as an *Euaresta* but closely related to *diffusa* and quite different from *tetanops* and *persuasa*.

Hering (1940) effectively resolved the confusion by establishing *Gymnocarena* for *diffusa*, and Quisenberry (1950) assigned *tricolor* to it. A single specimen in the U. S. National Museum represents yet a third species and is described below as *bicolor*, n. sp.

Generic diagnosis: Frons bare; gena directly below eye distinctly less than one-half the eye height; proboscis not geniculate; face without carina; three pairs lower fronto-orbitals; two pairs upper fronto-orbitals, the posterior pair not convergent; postoculars pale but slender and pointed; third antennal segment rounded apically. Humeral, supra-alar, and postsutural present; 1 pair dorsocentrals, situated in a transverse line between anterior supra-alars; vein r-m distinctly apicad of midpoint of cell 1st M_2 .

KEY TO KNOWN SPECIES OF GYMNOCARENA HERING

1. Wing pattern with an almost continuous transverse hyaline band between costa and posterior margin of cell Cu_1 , in addition to other hyaline markings *diffusa* (Snow)
 Wing pattern without such a continuous band, although other markings are present 2
2. Cell R_1 with two hyaline marks distad of apex of stigma; wing field consisting of two distinctly different shades of brown, one anterior and one posterior to veins M and M_{1+2} *tricolor* (Doane)
 Cell R_1 with one hyaline mark distad of apex of stigma; wing field unicolorous *bicolor*, n. sp.

Gymnocarena diffusa (Snow)

Oedicarena diffusa Snow, 1894, Kansas Univ. Quart. 2: 161; pl. VII, Fig. 9.—Doane, 1899, Jour. New York Ent. Soc. 7: 179.—Curran, 1934, Fam. Gen. North American Dipt., p. 290; Fig. 30.

Straussia diffusa: Coquillett, 1899, Jour. New York Ent. Soc. 7: 261.

Strauzia diffusa [sic]: Cresson, 1907, Trans. American Ent. Soc. 33: 100.

Gymnocarena diffusa: Hering, 1940, Siruna Seva 1: 4.

The wing of this species has been excellently illustrated by Curran (1934), and is distinctive in having an almost continuous transverse hyaline band from the costa to the posterior margin of the wing in cell Cu_1 in addition to a number of other hyaline markings. The field color is such a light shade of brown in some specimens that the pattern of hyaline markings is difficult to distinguish.

The species inhabits the Great Plains region of the United States. The eastern limit of its range is Missouri, the northernmost record is Montana; the species extends into the southwest as far as Arizona. Although *diffusa* is a rather common species, nothing is known about its larval habitat.

Gymnocarena tricolor (Doane)

Euaresta tricolor Doane, 1899, Jour. New York Ent. Soc. 7: 191; pl. IV, Fig. 9.—Aldrich, 1905, Smiths. Misc. Coll. 46(1444): 613.

Tephritis tricolor: Coquillett, 1899, Jour. New York Ent. Soc. 7: 264.

Gymnocarena tricolor: Quisenberry, 1950, Jour. New York Ent. Soc. 58: 10.

Doane's (1899) description and wing figure are quite sufficient to place this little-known species. The wing pattern consists of clear hyaline spots on a field of two contrasting shades of brown distinctly divided from each other along veins M and M_{1+2} , the dark shade lying anterior and the light shade posterior to this line.

The species was originally described from South Dakota. The only cabinet specimen other than the holotype is in the U. S. National Museum and bears the label "Cranmoor, Wisc., VIII.16.09."

***Gymnocarena bicolor*, new species**

(Fig. 3)

Male: Frons yellow, parallel-sided, 0.8 times as wide as one eye at vertex; in lateral view, head 1.4 times as high as long; gena directly below eye 0.2 times as high as eye; face whitish, produced anteriorly at oral margin; antenna 0.8 times as long as face. Mesonotum yellow with fine yellow setae in addition to the larger bristles; thorax without dark markings of any kind; scutellum with 4 bristles; head and thoracic bristles light brown. Wing pattern as in Fig. 3; vein R_{2+3} haired nearly to apex; vein r-m situated distad of apex of stigma, distad of mid-point of cell 1st M_2 , and at a distinct angle to vein m; cell 1st A drawn to a point along vein $Cu_2 + 2nd A$. Legs and abdomen completely yellow, without dark markings.

Wing length: 9 mm.

Holotype: ♂, Indian Creek Canyon, Chiricahua Mountains, Arizona, 6100 ft. U. S. National Museum Type No. 64872.

Discussion: In addition to the characters given in the generic description, the wing figures and key adequately characterize this species. It is easily separable from *tricolor* by the even brown color of the wing field and the different arrangement of hyaline spots as shown.

Genus *Oedicarena* Loew

Oedicarena Loew, 1873, *Smiths. Misc. Coll.* 11(256): 247. Type species *tetanops* Loew (*ibid.*, p. 245, pl. XI, Fig. 15).

A discussion of the history of this genus will be found under the treatment of *Gymnocarena* in the present paper. The species of *Oedicarena* differ markedly from those of *Gymnocarena* in possessing a prominent facial carina, a gena at least as high as one-half the eye height, golden mesonotal pollen, and the dorsocentrals situated very close to the acrosticals. *Oedicarena* very closely resembles *Rhagoletoides* Foote (1960) in having a prominent facial carina, golden mesonotal pollen, and a suggestion of paired brown mesonotal spots, but differs from that genus in lacking strong femoral spines and a narrow gena.

The two species now comprising *Oedicarena*, *tetanops* (Lw.) and *persuasa* (O.S.), are represented by holotypes in the Museum of Comparative Zoology. They may be recognized by the following characters:

1. Cells 1st and 2nd C, basal half of cell R, and cell 1st A yellow;
brown spot in apex of cell R₅ continuous along costa with
transverse band covering vein m *persuasa* (O.S.)
- Cells 1st and 2nd C, basal half of cell R, and cell 1st A hyaline;
brown spot in apex of cell R₅ isolated *tetanops* (Lw.)

O. persuasa was originally described from Denver, Colorado, and has not been recorded since; *tetanops*, as far as known, occurs only in Mexico and has not been captured within the United States.

Genus *Zonosemata* Benjamin

(Fig. 4)

Zonosemata Benjamin, 1934, U. S. Dept. Agric. Tech. Bull. 401: 17.
Type species: *Trypeta electa* Say.

The diagnosis and a discussion of this close ally of *Rhagoletis* Loew are detailed by Benjamin (1934). *Zonosemata* is a North American genus containing two species, *electa* (Say), the pepper maggot, and *vittigera* (Coq.). A short but excellent summary of the distribution, hosts, and economic importance of *electa* is already available (Anon, 1959), and a more detailed account is given by Benjamin (1934). *Z. vittigera*, however, has been generally overlooked in discussions of the genus.

Adults of *vittigera* have been collected from alfalfa, cotton, *Helianthus* spp., orange, peach, and quince and are commonly attracted to traps baited for the Mexican fruit fly (*Anastrepha ludens* (Lw.)) in the Rio

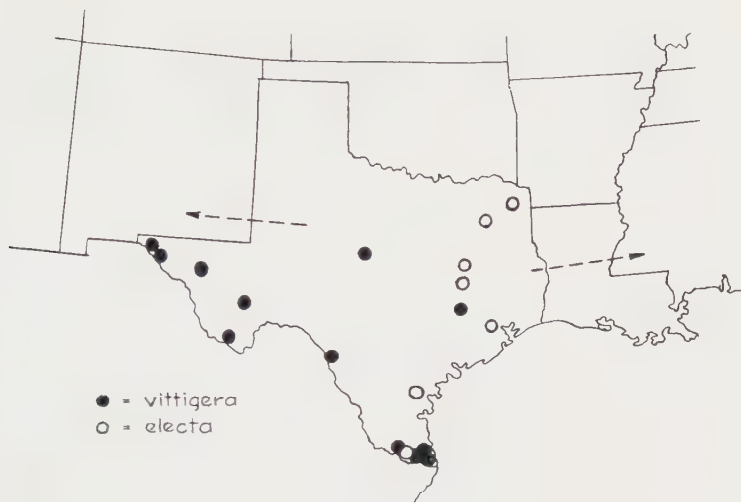


FIG. 4

Grande valley of Texas. However, the only plant authenticated as a larval habitat is *Solanum eleagnifolium*, the silverleaf or white horse-nettle. This plant is found in dry, open woods, prairies, waste places and disturbed soil in southwestern United States and adjacent Mexico; the northern limit of its range is in Missouri, and the plant has been found occasionally in Louisiana, Ohio, and Florida (Fernald, 1950). This distribution agrees well with that of *vittigera*, based on specimens seen in this study from the following localities:

UNITED STATES. ARIZONA: Amado, Aura Valley, Benson, Buckeye, Douglas, Ft. Apache, Lavern, Mesa, Nogales, Pearce, Sedona, White River, and Wilcox. NEW MEXICO: Belen, Las Cruces, Mesilla, Rodeo, and 7 mi southeast of Rodeo. CALIFORNIA: A single female captured in Santa Fe R.R. Pullman, San Francisco (1929). TEXAS: Brownsville, Bryan, Coleman, Donna, Eagle Pass, El Paso, Ft. Davis, Harlingen, Pine Springs, Presidio, and Weslaco (all shown on map, Fig. 4). MEXICO. TAMAULIPAS: Matamores and Reynosa.

Figure 4 is based only on specimens seen in this study and shows the limited area in which the ranges of *vittigera* and *electa* overlap. No intergrading characters in any of the Texas specimens of either species could be found.

The mesonota of both species are yellow laterally and centrally and have wide, paired, sublateral brown stripes which are united anteriorly but divided posterior to the suture. In *vittigera* these stripes are united by a dark transverse streak at the base of the scutellum; this mark is usually absent in *electa*. In addition, *vittigera* has paired sublateral black

spots anterior to the mesonotal suture, much of the post-scutellum is black, the metanotum has paired lateral black stripes, and black spots are present in the center of the thoracic pleural area and on the sternopleuron centrally, characters never present in *electa*. The wing bands of *vittigera* are narrower and more sharply defined, although their arrangement is nearly the same in the two species. Few external structural differences distinguish them from each other, but the aedeagus of *vittigera* is narrower in proportion to its width (2:6) than that of *electa* (2:5), a reliable means for separating them.

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EXPLANATION OF FIGURES

Right wing, dorsal view, Tephritidae. Fig. 1, *Acrotaenia testudinea*

(Lw.); Fig. 2, *Metatephritis fenestrata*, n. gen., n. sp.; Fig. 3, *Gymnocarena bicolor*, n. sp.

Fig. 4. Distribution of *Zonosemata electa* and *Z. vittigera* in Texas. Arrows indicate approximate direction of additional locality records (left, *vittigera*; right, *electa*).

PROCEEDINGS
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A NEW SPECIES OF *KURODAIA* (MALLOPHAGA:
AMBLYCERA) FROM THE COLLARED SCOPS
OWL OF THAILAND

BY ROBERT E. ELBEL AND K. C. EMERSON

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Oklahoma and Stillwater, Oklahoma*

Scops Owls and Screech Owls are parasitized by the mallophagen genera *Kurodaia* and *Strigiphilus*. Species of both genera are found on other hosts of the Avian order Strigiformes. *Kurodaia painei* (McGregor, 1912) and *Strigiphilus otus* Emerson, 1955, are found on the Screech Owl, *Otus asio* (Linnaeus). *Strigiphilus heterogenitalis* Emerson and Elbel, 1957, was described from the Collared Scops Owl, *Otus bakkamoena lettia* (Hodgson). The fact that the *Kurodaia* from the latter host was new, has been mentioned previously by the authors (1959) in a discussion of the taxonomic position of the Collared Scops Owl as indicated by the Mallophaga. The new species of *Kurodaia* is herewith described and illustrated from material collected by Robert E. Elbel, while he was assigned to the United States Operations Mission to Thailand. The skins of the host are in the U. S. National Museum and were identified by H. G. Deignan. Appreciation is expressed to John S. Wiseman and the Texas State Department of Health for the loan of specimens of *Kurodaia painei*.

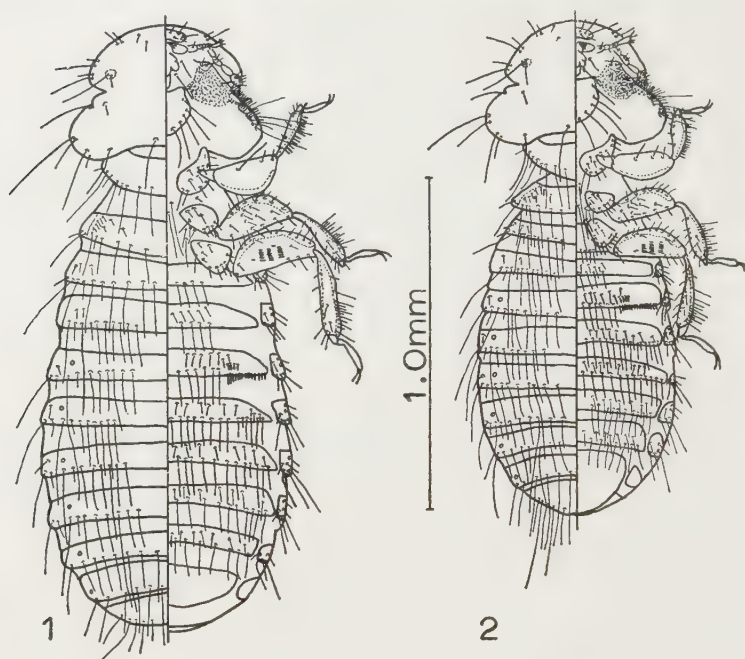
***Kurodaia deignani*, new species**

Holotype male: General shape and chaetotaxy as shown in Figure 2. Ventral chaetotaxy of terminal abdominal segments as shown in Figure 5. Genitalia as shown in Figure 7.

Allotype female: General shape and chaetotaxy as shown in Figure 1. Ventral chaetotaxy of terminal abdominal segments as shown in Figure 3.

Type host: *Otus bakkamoena lettia* (Hodgson).

Type material: Holotype male and allotype female, collected at Ban



FIGS. 1-2

Muang Khai, Tha Li, Loei, Thailand on 29 January 1955 by Robert E. Elbel, have been deposited in the U. S. National Museum. Paratypes: 4 males and 3 females, from the type host, were collected at Ban Thung Chuak, Salok Bat, Khanu, Kamphaeng Phet, Thailand, on 22 June 1953 by Robert E. Elbel, of which 2 males and 1 female were deposited in the U. S. National Museum and a pair each in the collections of the authors.

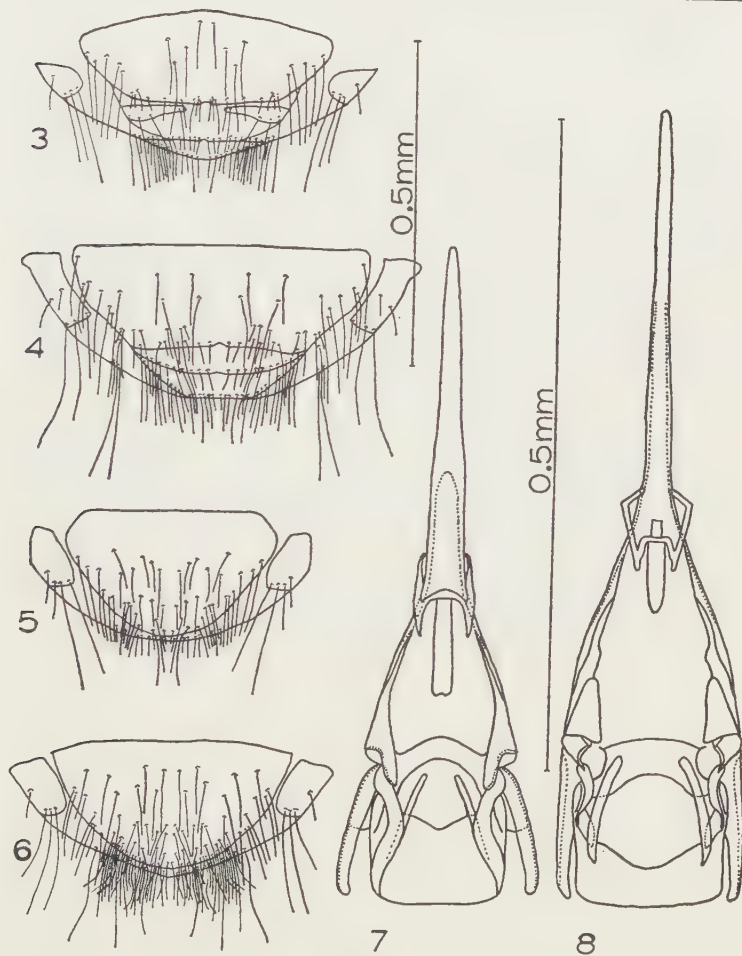
Measurements of *K. deignani*

	HOLOTYPE MALE (mm)	ALLOTYPE FEMALE (mm)
Length of head	0.34	0.37
Width of head	0.54	0.59
Width of prothorax	0.33	0.39
Width of mesothorax	0.41	0.50
Width of abdomen	0.59	0.71
Total length	1.46	1.86

Discussion: *Kurodaia deignani* differs from *K. painei* (McGregor) in size, chaetotaxy of terminal abdominal segments, and structure of the male genitalia. *K. deignani*, especially the male, is smaller than *K. painei*.

Measurements of *K. painei*

	MALE (mm)	FEMALE (mm)
Length of head	0.40	0.40
Width of head	0.64	0.64
Width of prothorax	0.41	0.45
Width of mesothorax	0.49	0.54
Width of abdomen	0.69	0.80
Total length	1.71	1.97



FIGS. 3-8

These measurements are greater than those given by McGregor in his original description. Differences in chaetotaxy of terminal abdominal segments are apparent from a comparison of Figures 3 and 5 for *K. deignani* with Figures 4 and 6 for *K. painei*. Differences in the male genitalia between *K. deignani* and *K. painei* may be seen by comparing Figures 7 and 8. The measurements and illustrations of *K. painei* are from specimens in the Texas State Department of Health, collected from *Otus asio* in Travis County, Texas, on 5 April 1951 and Zavalla County, Texas, on 25 April 1951 by Johnson and Walker. *Kurodaia deignani* is named for H. G. Deignan, who considered the evidence from the Mallophaga to help determine that the American and Asian forms of *Otus* were not conspecific (Elbel and Emerson, 1959).

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EXPLANATION OF FIGURES

Kurodaia deignani, new species. Fig. 1.—Dorsal-ventral view of female. Fig. 2.—Dorsal-ventral view of male. Fig. 3.—Ventral view of terminal abdominal segments, female. Fig. 5.—Ventral view of terminal abdominal segments, male. Fig. 7.—Male genitalia.

Kurodaia painei (McGregor, 1912). Fig. 4.—Ventral view of terminal abdominal segments, female. Fig. 6.—Ventral view of terminal abdominal segments, male. Fig. 8.—Male genitalia.

Illustrations of similar structures are drawn to the same scale.

PROCEEDINGS
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A NEW CRAYFISH OF THE GENUS *PROCAMBARUS*
FROM SOUTHERN ALABAMA
(DECAPODA, ASTACIDAE)

BY HORTON H. HOBBS, JR. AND MARGARET WALTON

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On 4 June 1940, Lewis Berner, Charles Benton, and the senior author collected four specimens of this new species from simple burrows in a drying creek-bed near the southeastern city limits of Haynesville, Lowndes County, Alabama. Not until April, 1958 were additional specimens obtained when Thomas L. Johnson and the senior author collected 109 specimens from five localities in Lowndes, Montgomery, and Wilcox counties, Alabama.

This crayfish is a member of the *Blandingii* Group and is closely related to *Procambarus acutissimus* (Girard, 1852) and *P. hayi* (Faxon, 1884). While the extent of its range is not known, failure to find it in collections to the north and east in habitats similar to those in which it occurs suggests that Montgomery and Lowndes counties lie near the northern and eastern limits.

We wish to acknowledge, with thanks, the assistance given by those persons mentioned above in collecting the specimens on which this description is based.

***Procambarus lophotus*,¹ new species**

Diagnosis: Rostrum with small lateral spines or if spines absent margins interrupted; areola 12 to 17 times longer than broad with one or two punctations in narrowest part and constituting from 32 to 37 per cent of total length of carapace; postorbital ridges terminating cephalically in small spines or tubercles; lateral spines small, often tuberculiform; inner margin of palm of chela of first form male with one or two irregular rows

¹ *lophotus*, G.—crested. So named because of the helmet-like cephalic process of the first pleopod of the male.

of eight or nine tubercles; male with hooks on ischiopodites of third and fourth pereopods. First pleopods of first form male asymmetrically situated, reaching coxopodite of third pereopod and with a cephalolateral knob at base of terminal elements; no prominent cephalic hump or shoulder. Mesial process noncorneous, slender, subspiciform and directed caudodistally and somewhat laterally; cephalic and caudal processes and central projections all corneous and directed caudodistally (Figs. 1 and 6). Annulus ventralis broader than long with a broadly S-shaped sinus that terminates caudally on an elevated prominence; cephalic portion hidden by multi-tuberculate extensions of the sternum immediately cephalic to annulus.

Holotype male, Form I: Body subovate, compressed laterally; abdomen narrower than thorax (15.5 and 18.8 mm respectively); width and height of carapace subequal in region of caudodorsal margin of cervical groove (18.8 and 18.4 mm).

Areola narrow (14 times longer than broad) with one or two punctations in narrowest part and constituting about 34.1 per cent of entire length of carapace.

Margins of rostrum not swollen, strongly convergent and with acumen indistinctly delimited from remainder of rostrum. Acumen narrowly triangular and reaching distal end of penultimate podomere of peduncle of antennule; upper surface of rostrum shallowly concave with a few widely scattered setiferous punctations. The usual submarginal row of setiferous punctations continuous onto acumen. Subrostral ridges weak and evident only at base of rostrum.

Postorbital ridges clearly defined, grooved laterally, and terminating cephalically in small tubercles; suborbital angle small and obtuse; branchiostegal spine small and tuberculiform. Lateral surface of carapace strongly granulate, lateral spines represented by a pair of tubercles that are only slightly larger than adjacent granulations.

Abdomen and carapace subequal in length (40.5 and 41.0 mm).

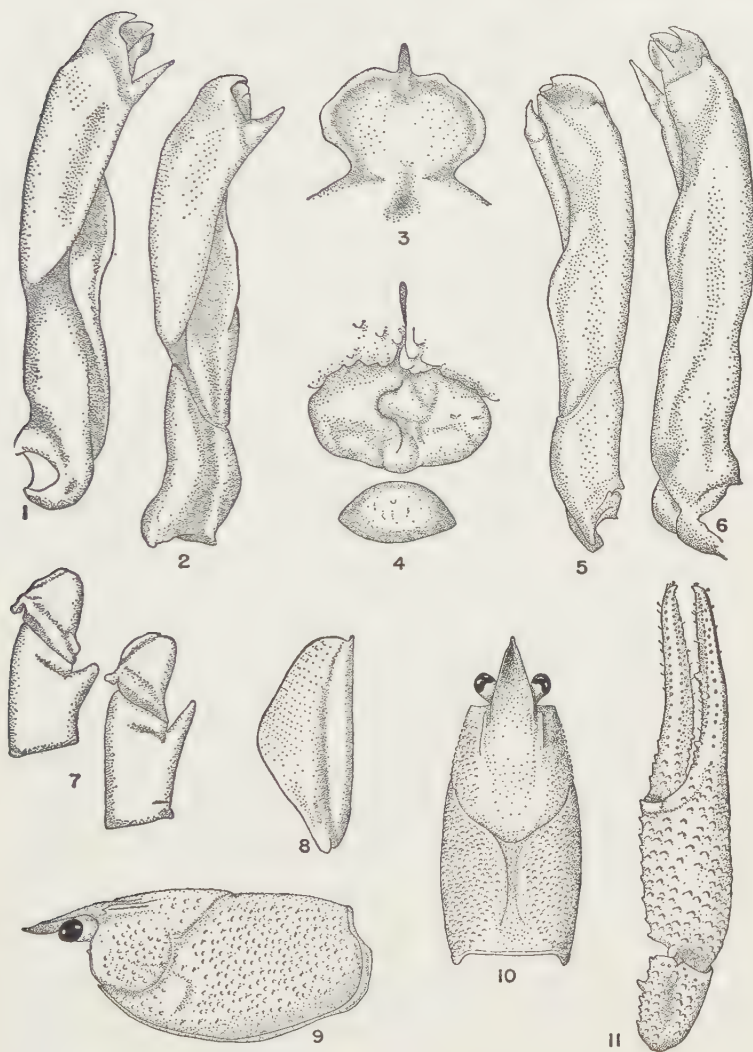
Cephalic section of telson with two spines in each caudolateral corner.

Epistome (Fig. 3) broader than long with a prominent cephalomedian spine and a median longitudinal carina near cephalic margin.

Antennules of the usual form with a small spine on lower surface of basal segment.

Antennae extend caudad to fifth abdominal tergum. Antennal scale (Fig. 8) of moderate width, broadest near midlength, and with a small spine at extremity of outer distal margin; lamellar portion with no distinct angles.

Right chela elongate, four times longer than broad and length of chela greater than length of carapace (42.5 and 41.0 mm). All surfaces of palm studded with squamous tubercles. Inner margin of palm with poorly defined rows of tubercles (in silhouette, nine tubercles may be seen extending above the surface). Lower surface of palm with one tubercle somewhat larger than the others at base of dactyl. Fingers not gaping, both with poorly defined submedian ridges above and below,



FIGS. 1-11

especially on dactyl. Opposable margin of immovable finger with a row of 16 knob-like tubercles, only the third and fourth from base of which are conspicuous; below this row at base of distal third is the usual prominent tubercle. Crowded minute denticles along entire length of opposable margin. Lateral margin with a row of squamous tubercles along proximal fourth and continuous with it to tip of finger a row of

setiferous punctations. Opposable margin of dactyl with an upper row of 14 knob-like tubercles along proximal two-thirds of finger; additional tubercles irregularly placed below this row between the fourth and twelfth tubercles; upper row with crowded minute denticles along distal three-fifths. Mesial margin of dactyl with a row of five tubercles along proximal fourth, distal to which continues a row of setiferous punctations. Mesial, upper and lower proximal portion of dactyl with a few scattered tubercles; elsewhere with rows of setiferous punctations.

Carpus of first right pereopod about 1.7 times longer than broad with a shallow, slightly oblique, longitudinal furrow. Tuberculate except on lower and upper lateral surfaces. Usual semicircular arrangement of four tubercles between the upper and lower condyles distinct but none spiniform; remaining tubercles on mesial surface smaller and none conspicuously larger than others.

Merus of first right pereopod with tubercles on upper, lower, and mesio-distal surfaces; elsewhere punctate. Two prominent tubercles on upper surface near distal extremity. Lower surface with a mesial row of 16 spine-like tubercles and a lateral one of 13; additional tubercles flanking both rows. Lower margin of ischiopodite with a single row of six tubercles.

Ischiopodites of third and fourth pereopods with hooks (Fig. 7); hooks simple and that on fourth heavier and opposed by a small knob on corresponding basipodite.

Coxopodites of fourth and fifth pereopods with the usual projecting prominences—those on fourth knob-like and those on fifth tuberculiform.

First pleopod (Figs. 1 and 6) reaching coxopodite of third pereopod when abdomen is flexed. (See *Diagnosis* for description.)

Allotypic female: Differs from the holotype in the following respects: Epistome slightly more irregular and lacking median carina; cephalic section of telson with three spines in the caudodextral corner. Inner margin of palm of chela with a well-defined row of eight tubercles; fingers gaping; opposable margin of immovable finger with a row of 11 tubercles along proximal two-thirds with fourth and fifth from base larger. Opposable margin of dactyl with 11 tubercles, the third from base largest and with a gap between it and the second that received the fourth tubercle on dactyl when fingers are closed. A single row of minute denticles along distal third of opposable margin of both fingers. (See *Measurements*.)

Annulus ventralis (Fig. 4) broader than long with an S-shaped sinus, the caudal extremity of which lies on a prominent caudomedian elevation. Sternum immediately cephalic to annulus produced caudally in multi-tuberculate prominences that overlap slightly on the median line.

Morphotypic male, Form II: Differs from the holotype in the following respects: Cephalic portion of telson with three spines in the caudo-sinistral corner. Carpus with the tubercles more acute and several on mesial surface larger than those elsewhere on podomere; hooks on ischiopodites of third and fourth pereopods reduced and neither opposed by a knob on corresponding basipodite. First pleopod (Figs. 2 and 5) with

all terminal elements of holotype but noncorneous and not so distinctly delineated.

Measurements (in millimeters)

	HOLOTYPE	ALLOTYPE	MORPHOTYPE
Carapace:			
height	18.4	19.6	17.6
width	18.8	20.3	17.9
length	41.0	42.4	40.5
Areola:			
width	1.0	1.0	1.0
length	14.0	13.9	13.7
Rostrum:			
width	6.5	6.9	6.2
length	10.2	11.0	10.2
Right chela:			
length of inner margin			
of palm	15.9	9.6	11.3
width of palm	10.6	9.3	8.3
length of outer margin			
of hand	42.5	27.3	33.0
length of dactyl	24.0	16.2	18.8

Type locality: Roadside ditch, 3.4 miles northeast of Haynesville, Lowndes County, Alabama, on State Route 11. Here the road passes through gently sloping pasture lands with no trees in the immediate vicinity. The ditch, nowhere more than 1.5 feet deep, has a muddy bottom that supports a few grasses, particularly along the shallow margins. The current was sluggish to moderate at the time collections were made, and there is evidence that at times the ditch is dry. The open mouths of many burrows were observed before the water was clouded by dragging the seine over the muddy bottom. Specimens of *Procambarus lewisi* Hobbs and Walton (1959) and *Cambarus striatus* Hay (1902) were also collected here.

Disposition of types: The holotypic male, allotypic female, and morphotypic male are deposited in the U. S. National Museum (Nos. 104404, 104405, and 104406, respectively). A paratypic series, consisting of a first form male, a second form male, and a female are in the collection of Tulane University. The remaining paratypes are in the collection of the senior author at the University of Virginia.

Color notes: The ground color is pinkish-cream, almost flesh-colored. A pair of small purplish-tan spots occur immediately cephalic to the cervical groove near the attachments of the mandibular muscles, and extending caudally from the vicinity of the spots is a pair of narrow, longitudinal, grayish-green bands that extend to the caudal margin of the branchiostegites. The areola is distinctly pink delimited laterally by tan branch-

iocardiac grooves. The abdomen bears a broad, dorsomedian, wedge-shaped purplish-tan band, the apex of which lies on the fifth tergite; in addition, at the bases of each epimeron, which is pink, is a narrow longitudinal grayish-green bar. Viewed laterally, these bars are in line with the bands on the branchiostegites. The chelae are pinkish-cream with purplish-brown to greenish-black tubercles. Variations occur in the actual colors with a suffusion of tan in the pinkish areas and a darkening of the bands and spots, but the pattern seems to be constant.

Variations: The principal variations noted in this species seem to be associated with age. The young specimens are more spiniform, with well-defined marginal spines on the rostrum, lateral spines on the carapace, and spines on the cephalic extremities of the postorbital ridges. Too, the areola is proportionally broader in the immature animals, occasionally being only seven times longer than broad. None of the variations observed seem to be restricted to local populations.

Relationships: *Procambarus lophotus*, a member of the Blandingii Group (see Hobbs, 1942) has its closest affinities with *P. hayi* and *P. acutissimus*. It may be distinguished from the former by the position of the lateral knob-like prominence near the distal end of the first pleopod; in *P. hayi* it lies proximolateral to the caudal process and in *P. lophotus*, proximolateral to the cephalic process. The pleopod of *P. acutissimus* is almost straight and the tips of the cephalic process and central projection are directed approximately at right angles to the shaft of the appendage; in *P. lophotus* the entire appendage is bent caudally and the corresponding processes are directed caudodistally. The annuli ventrales of the three possess a caudomedian elevation on which the caudal extremity of the sinus terminates; however, the contour of the sinus of *P. lophotus* is decidedly more sinuous than in the other species.

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EXPLANATION OF FIGURES

Procambarus lophotus, new species. Fig. 1.—Mesial view of first pleopod of male, form I. Fig. 2.—Mesial view of first pleopod of male, form II. Fig. 3.—Epistome of male, form I. Fig. 4.—Annulus ventralis of female. Fig. 5.—Lateral view of first pleopod of male, form II. Fig. 6.—Lateral view of first pleopod of male, form I. Fig. 7.—Basipodites and ischiopodites of fourth and third periopods of male, form I. Fig. 8.—Antennal scale of male, form I. Fig. 9.—Lateral view of carapace of male, form I. Fig. 10.—Dorsal view of carapace of male, form I. Fig. 11.—Distal podomeres of cheliped of male, form I.

PROCEEDINGS
OF THE
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A NEW FAMILY OF MILLIPEDS OF THE ORDER
SPIROBOLIDA, WITH NOTES ON AN
ESTABLISHED FAMILY

BY WILLIAM T. KEETON

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The milliped order Spirobolida is a well-defined taxonomic group with representatives in all of the zoogeographic regions of the world. Many genera (152 according to Hoffman and Keeton, 1960) and hundreds of species have been described during the past 150 years. Yet, in few groups of animals has there been less serious effort to establish a satisfactory classification at the family level of the taxonomic hierarchy. At the time of their original description, many genera have simply been allocated to the order, with no mention of family position.

One important paper by Brölemann (1914) is an outstanding exception to the general lack of attention to the classification of the Spirobolida. Brölemann's work established a basis on which later research could have built a sound taxonomic system. But this basis has been largely ignored, and most workers have continued to place all new genera in "convenient" and widely known families such as Spirobolidae, Rhinocricidae, or Trigoniulidae, or not to place them in any family. Thus such validly described Brölemann families as Spirobolellidae (to which several "spirobolid" genera such as *Microspirobolus*, *Aporobolus*, *Spirobolinus*, and their relatives apparently belong) and Pseudospirobolellidae (to which such genera as *Guamobolus*, *Javobolus*, *Saipanella*, *Azygobolus*, etc. obviously belong) have all but disappeared from the literature.

Having become interested in the taxonomy of the Spirobolida while preparing a comprehensive revision of the family Spirobolidae (1960), I have begun a long-term study of

the order, with the goal of eventually providing for it an adequate and meaningful classification. In the course of this study, it has become evident not only that many genera must be moved from their existing positions to other families, but also that several new families are needed to accommodate genera which cannot any longer be left in the families into which they customarily have been shoved. I have (1959) proposed one such new family, and here propose another for two "orphan" genera.

ALLOPOCOCKIIDAE, New Family

Diagnosis: A family of the Spirobolidea as indicated by the structure of the phallopods, which do not possess the well-developed seminal bladders typical of the Trigoniulidea. Phallopods independent; telopodite, coxa, and coxal apodeme arranged in the essentially linear manner often seen in Spirobolidea. Distinguished from all other families of the Spirobolidea except Spirobolidae and Floridobolidae by the presence of well-developed coxae of the phallopods. Differs from these two families in having large apodemes of the coxal endites of the coleopods. Lacks the prominent basal sclerite present in Floridobolidae. Sternum of coleopods narrow, thus differing from the large sternum typical of Rhinocricidae and Spirobolellidae, but in its presence differing from the condition of Pseudospirobolellidae where the sternum is almost or completely absent.

Included genera: *Allopocockia* Brölemann, 1913, and *Chelogonobolus* Carl, 1919.

Discussion: The genus *Allopocockia* was first described by Brölemann (1913: 478; 1914: 34) for *Spirobolellus tylopus* Pocock, 1908, from Guatemala. Brölemann's knowledge of this species was limited to Pocock's published description, which included four drawings. Although this description was far superior to most being published during Pocock's time, it gave no information regarding the critical characters of the basal portions of the gonopods. As a result, Brölemann had to rely on his own best guess as to which family *Allopocockia* represented. He placed the genus in the Trigoniulidae, but indicated his uncertainty by putting a question mark before the name.

Five years later Carl (1919) reported the results of his examination of the type specimens of *Spirobolus nahuus* Saussure and Humbert. He found that this Mexican species closely resembled *Allopocockia tylopus*, but differed from it in lacking the striking modifications of the pregenital legs of males and in not having pronounced mesial ventral productions of the coxal endites of the coleopods. Carl made *nahuus* the type of a new genus, *Chelogonobolus*, and redescribed the species at the same time. In his usual thorough fashion, Carl carefully studied the basic characters of *nahuus* and made known for the first time the details of the more internal portions of the gonopods—the characters that had been unknown

to Brölemann in the case of *tylopus*. These characters made it necessary, as Carl remarked, to remove *Allopocockia* from the Trigoniulidae and to assign it and *Chelogonobolus* to some other family. Carl recognized the unusual characteristics of these two genera saying, "Ce qui est certain, c'est qu'ils occupent dans le système actuel une position tout à fait isolée et ne rentrent dans aucune des familles établies par Brölemann." In spite of this, however, having removed the genera from the Trigoniulidae, his natural conservative nature led Carl neither to establish a new family for them nor to place them in any other existing family. It now seems time to rescue these genera from the no-man's land in which they have lain neglected, and to describe for them the new family which they so obviously deserve.

I have chosen to base the new family name on the older of the two included genera in view of the possibility that future studies may necessitate regarding the two as congeneric.

My own first-hand knowledge of the group is limited to the type specimens of *Chelogonobolus nahuus*, which were lent to me for study by Hermann Gisin of The Muséum d' Histoire Naturelle, Genève, Switzerland, to whom my sincere thanks are extended. I shall here contribute no new information regarding the other species of the Allopocockiidae, but shall give more detailed treatment to *nahuus*.

Genus *Allopocockia* Brölemann

Allopocockia Brölemann, 1913, Bull. Soc. ent. France, p. 478. Type: *Spirobolellus tylopus* Pocock, by original designation.

Allopocockia Brölemann, 1914, Ann. Soc. ent. France, 83: 34.

Diagnosis: Distinguished from *Chelogonobolus* by the presence of a "distinct papilla" or bladder-like structure on the protarsus of the third leg of males; by having the last segment of the third to seventh legs of males "inflated," and the claws of these legs reduced to minute vestigial structures; and by having the mesial ventral corners of the coxal endites of the male coleopods produced ventrad.

Discussion: In some other spiroboloid groups striking modifications of male pregenital legs frequently occur and have often been found to warrant only specific recognition. Generic level differences in these characters are generally accompanied by gonopodal differences more elaborate than those known to exist between *Allopocockia* and *Chelogonobolus*. In the absence of study specimens of *Allopocockia*, however, and in our present meagre state of knowledge of this small but very distinct family, I do not feel it advisable at present to regard the two genera as synonymous.

Included species: Only *A. tylopus* (Pocock), from Tecpam, Guatemala.

Genus *Chelogonobolus* Carl

Chelogonobolus Carl, 1919, Rev. Suisse Zool., 27: 399. Type: *Spirobolus nahuus* Saussure and Humbert, by original designation.

Diagnosis: Distinguished from *Allopocockia* by the characters of the male pregenital legs and gonopods mentioned above.

Chelagonobolus nahuus (Saussure and Humbert)

(Figs. 1-7)

Spirobolus nahuus Saussure and Humbert, 1869, Rev. Mag. Zool., ser. 2, 21: 154.

Spirobolus nahuus Saussure and Humbert, 1872, Mission scientifique Mexique, Myriapodes, p. 86.

Spirobolellus nahuus, Pocock, 1908, Biol. Centr.-Amer., Chilopoda and Diplopoda, p. 88.

Chelagonobolus nahuus, Carl, 1919, Rev. Suisse Zool., 27: 401, Figs. 32-39.

Description and discussion: I shall not attempt to give a full redescription of this species inasmuch as Carl's treatment is an excellent one. My concern here is only in adding some details not fully covered in previous publications. My discussion is based on an examination of the type material belonging to the Geneva Museum. This material, all in a single vial, consists of: one anterior portion of head + 21 segments, with male gonopods *in situ*; two mid-body sections of 5 and 7 segments; three posterior portions of 14, 15, and 16 segments respectively, each with complete anal areas; and a separate set of male gonopods.

The original description gives segment counts of 35 for a female, and 32 and 35 for males. These are small millipeds compared to many spiroboloids, being 16-23 mm long according to the literature, and averaging about 1.7 mm in width according to my measurements.

Clypeus broad, its margins very rounded, there being no distinct ventral corners. Lateral corners of clypeus not very distinct, sloping rather gradually into moderately shallow antennal grooves. Parietal sclerites unmodified. Mandibular cheeks not appreciably grooved for reception of antennae; ventrodistal corners of stipites of mandibles abruptly angular, the stipites being thus rather square distally but with distal margins very slightly concave. Eye patches subcircular, the eyes not arranged in distinct rows, about 17-20 eyes per patch. Labrum small, with 3 indistinct teeth assymetrically arranged. Clypeal setae 3 + 3; labral setae 5 + 3 (both counts based on only one specimen). Antennae very short and stout; second segment slightly longer than the others, slightly surpassing lateral margins of clypeus; few small scattered setae on first 4 antennal articles, more distal articles densely hirsute; 4 antennal sensory cones. Gnathochilarium (Fig. 1) of the usual general spiroboloid construction, including an undivided prebasilare, but mentum (M) somewhat distinctive in having distinctly swollen lateral areas at bases of stipites (S), these convex areas (ca) being partially set-off by indistinct grooves (apparently not sutures); stipital setae 3 + 3.

Collum not unusually large, covering only vertex of head, subtruncate laterally, the anterior corners much more pronounced than the posterior

corners; anterior margining ridges present but not pronounced. Second segment not produced ventrolaterally, bending abruptly mesad at level of lateral ends of collum.

Tergites smooth, without rugulae but with a few scattered puncta; striae on extreme ventral portions only. Segmental suture extremely indistinct, not marked by any external groove, visible only as an obscure light line in cleared specimens. Repugnatorial pores located more posteriorly than in Spirobolidae, their exact location relative to the segmental suture being difficult to determine because of the obscure nature of the latter; apparently about a third of peritreme area of each pore is anterior to the line of the suture, and about two-thirds of peritreme area is posterior to this line. I was unable to detect the suture itself in the immediate vicinity of the pore, and thus cannot say whether it curves around the pore anteriorly or posteriorly.

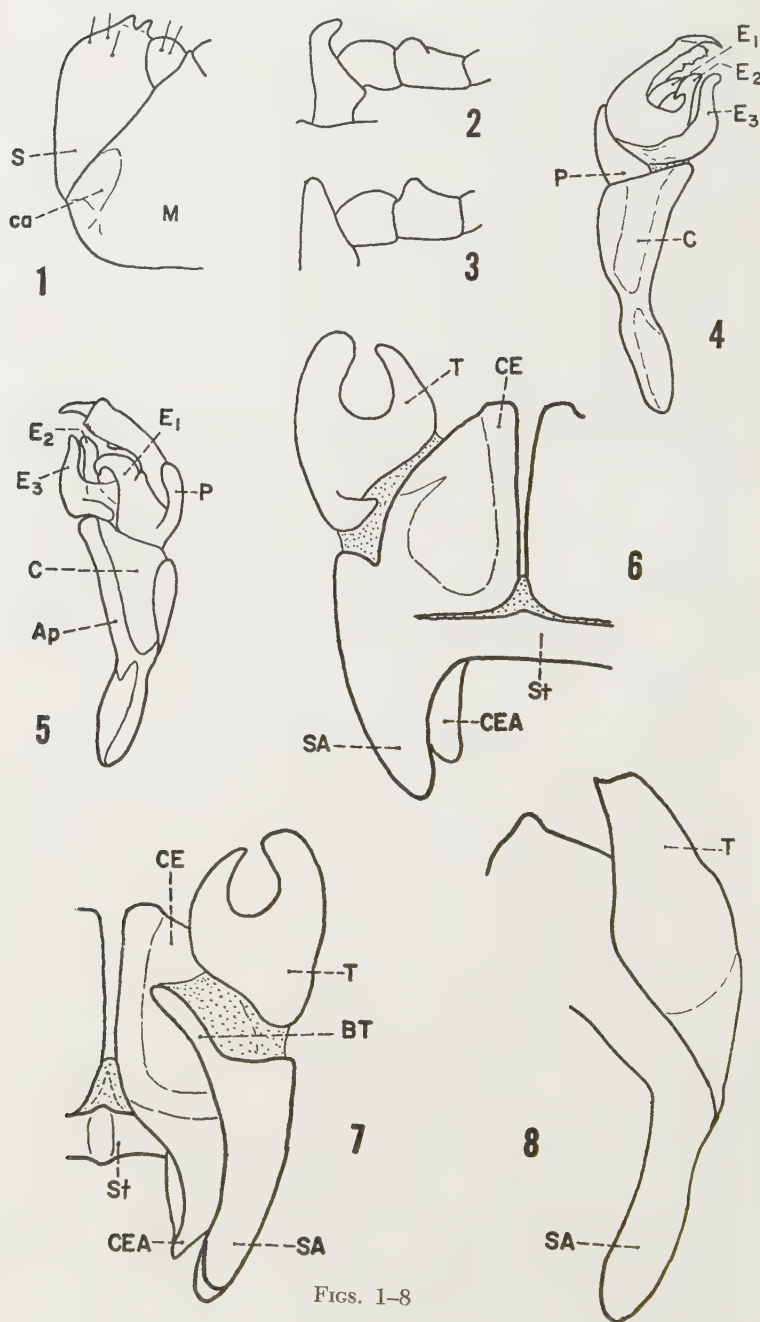
Entire tergum of telson broadly triangular, its obtuse apex just reaching posterior border of anal valves, which are thus not visible from dorsal view. Valves with smoothly convex surfaces, these meeting evenly with no trace of anal lips and no reentrant angle.

Coxae of third legs of males (Fig. 2) much produced ventrad; distal portions of lobes thus formed bent laterad. Coxae of fourth (Fig. 3) and fifth legs of males also produced ventrad forming lobes with narrowly rounded apices, but these not bent laterad. Coxae of sixth legs only slightly produced; those of seventh legs not produced. All legs with very few ventral setae and no ventral pads. Claws $\frac{1}{3}$ – $\frac{1}{2}$ the length of the last podomeres.

Postgenital bar forming a large ridge behind gonopod socket.

The gonopods, so important in classification, have been well described and figured by Carl. I shall mention only a few details here. As shown in Figures 6 and 7, the coxal endites of the coleopods are not uniformly sclerotized; a heavily sclerotized region runs along the mesial border of each endite, curves laterad along the base of the endite, then ventrad along the ventrolateral border, and ends at about the midpoint of this border. The portion of the endite enclosed by this heavier area is very thin, almost membranous. The sternum (S) is narrow, but the sternal apodemes (SA) are broad and each curves around onto the caudal face of the coleopod, thus enclosing a large mesial concavity. The "bride trachéenne" (BT), as Brölemann (1914) calls it, is very well developed and is attached by a membrane directly to the telopodite, there being between them no well-defined posterior coxal bar ("fémoroids" of Brölemann) such as is seen in most families. The telopodites (T; shown in the figures pulled ventrolaterad from the normal position) are not closely united to the rest of the coleopod structure, but are connected to it only by membranes. The prominent condyle on the cephalolateral corner is shown in Figure 6, as is the unusual shape of the telopodite. Figure 7 shows the very stout, mesially concave apodeme of the coxal endite (CEA).

Figures 4 and 5 show the phallopods, the details of which are more



FIGS. 1-8

easily understood from the drawings than from lengthly verbal descriptions. I shall here only call attention to the large expanded coxal piece (C) fused with the more strongly sclerotized apodemal ridges (Ap); to the three separate endites of the telopodite (E_1 , E_2 , E_3); and to the separate and strongly sclerotized plate (P) on the outer surface of the base of the telopodite. Insofar as Pocock (1908, Tab. 7, Fig. 8c) has shown the details of the phallopods of *Allopocockia tylopus* (Pocock), they seem to correspond closely with those here shown for *Chelogonobolus nahuus*, even to the shape of the distal portion of the second endite (E_2). It is this close similarity that prompts me to question the validity of the separate genera proposed for these two species.

I have seen no female cyphopods of *C. nahuus*, but would predict that the cephalic and caudal plates will be found to be fused along a lateral suture, as seems to be typical in the Spirobolidae.

Chelogonobolus atriculus (Pocock), new combination

Spirobolellus atriculus Pocock, 1908, Biol. Centr.-Amer., Chilopoda and Diplopoda, p. 88, tab. 7, Figs. 9a-c.

Discussion: Pocock's description and drawings establish the fact that this form does not exhibit the characters of the male pregenital legs and coleopods which distinguish *Allopocockia*. It seems to resemble closely *C. nahuus* and to belong in *Chelogonobolus*. I can say nothing regarding the possible conspecificity of this Guatemalan species with the Mexican *C. nahuus*.

FLORIDOBOLIDAE

Floridobolus penneri Causey

(Fig. 8)

Floridobolus penneri Causey, 1957, Proc. Biol. Soc. Washington, 70: 206, Figs. 1-3.

Floridobolus penneri, Keeton, 1959, Bull. Brooklyn Ent. Soc., 54: 2, Figs. 1-12, 14-16.

Discussion: Both previous published accounts of this species were based on relatively few specimens. Recently, however, Thomas Eisner, of Cornell University, and his assistants Roger S. Payne, Benjamin Dane, and Ralph L. Ghent spent a week at the type locality, Archibold Biological Station, Lake Placid, Highlands County, Florida. There they collected a large series of *F. penneri* for use in physiological and behavioral studies in their laboratory at Cornell. They have given me 25 adult specimens (24 male, 1 female) from their series, and I wish to express my appreciation to them. These specimens make it possible to give more accurate information regarding several characters of this species.

The number of segments shows less variation than is commonly encountered in spiroboloid millipeds, the count varying from 47 to 51 but most specimens having 48 (16 of 25 specimens) or 49 (5 of 25 specimens), with an average of 48.3. Lengths of adults examined range from

60 mm to 92 mm (average 74.2 mm); widths from 10.0 mm to 12.8 mm (average 11.6 mm). The L/W ratios of adults over 70 mm long vary from 6.3 to 7.4, averaging 6.7; the same ratios for adults 60–69 mm long vary from 5.6 to 6.4, averaging 5.9; the average for all adults examined, regardless of size, is 6.4.

The total number (both sides combined) of clypeal foveae ranges from 5 in one specimen to 11 in two specimens, but most individuals have 8–10, with an average of 9.1. In addition to the usual 4 or 5 such foveae on each side of the clypeus, most specimens have on each side an additional fovea-like depression or cleft located on the prominent ventral corner of the clypeus; these do not bear setae and are not included in the counts given above. The total of labral setae varies from 13 to 24, with an average of 17.5.

The number of eyes per patch is usually greater than in most spirobolids, ranging from 52–66 with an average of about 60.

The convexity of the apex of the mentum of the gnathochilarium has been found to be constant and is thus a trustworthy key character. The structure of the gnathochilarium is in other respects of the typical spiroboloid pattern. It should be mentioned here that well-formed cardines are present in this genus as well as in other members of the order Spirobolida, in spite of Attem's statement (1926: 192) to the contrary (mentioned by Hoffman and Orcutt, 1960: 101). These small sclerites often cannot be seen on the outer face of the gnathochilarium as each is covered by a membrane located in the area between the base of the stipes and the basal corner of the mentum. If the entire mouthpart is removed from the head and viewed from the inner surface, the cardines are readily seen. As seems to be true of all spiroboloid species, each lingual lamella bears two prominent setae. The number of macrosetae on the distal portion of each stipes varies from 6 to 11, with the total number averaging 16.3.

The knob-like productions on the distal portions of the ventral surfaces of the second podomeres of the walking legs apparently vary greatly, and they are often small and much less noticeable than I previously (1959, Fig. 4) indicated.

My earlier interpretation of the structure of the male gonopods needs some revision in light of recent findings using cleared specimens. I indicated (1959: 6 and Figs. 10–12) that there was only one posterior structure of the coleopod, and considered this to be the posterior coxal bar, a telopodite not being present. In cleared specimens, however, a faint sutural line can be seen as indicated here in Figure 8. Apparently, then, the telopodite and posterior coxal bar have become fused together, the former thus being no longer movable. This condition is unique in the order so far as I know. Variation in the details of the distal portions of the phallopods seems to be very slight, although the expanded portion of the distolateral coxal surface shows much variation in extent. The basal sclerite is always present and is easily seen in cleared specimens.

Eisner reports several interesting observations on the habits of this

species in the wild. Specimens were abundant between 9 and 14 September 1959, under dead logs on sand. They were not common under logs that were buried more deeply in the sand. The species could only be found in areas where there were stands of woody plants, thus differing from *Narceus gordanus* (Chamberlin) which was common in open sandy places where there were few such woody plants. The collectors are sure that *F. penneri* never burrowed deep into the sand in the manner typical of *N. gordanus*, the latter species making characteristic round tunnels, the mouths of which dotted sandy areas. *F. penneri* was often seen feeding on the fruiting bodies of the palmetto plants. Eisner notes that the species was far more common in September, 1959, than in late June, 1958, being as common as *N. gordanus* in September but much less common than that species in June.

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EXPLANATION OF FIGURES

Figs. 1–7, *Chelogonobolus nahuus* (Saussure and Humbert). Fig. 1.—gnathochilarium, right half. Fig. 2.—basal portion of right third leg, cephalic view. Fig. 3.—basal portion of right fourth leg, cephalic view. Fig. 4.—left phallopod, cephalic view. Fig. 5.—left phallopod, caudal view. Fig. 6.—left coleopod, cephalic view. Fig. 7.—left coleopod, caudal view (in both Figs. 6 and 7 the telopodite has been pulled out of

normal position). Fig. 8.—*Floridobolus penneri* Causey, portion of left coleopod, caudal view, showing indistinct sutural line between telopodite and posterior coxal bar. Abbreviations: Ap—apodemal ridges, BT—bride trachéene, C—coxal piece, ca—convex area of mentum of gnathochilarium, CE—coxal endite, CEA—apodeme of coxal endite, E₁, E₂, E₃—endites of the telopodite, M—mentum, P—scleratized plate, S—stipes, SA—sternal apodeme, St—sternum, T—telopodite.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

GEOGRAPHIC VARIATION IN THE WESTERN WOOD
PEWEE (*CONTOPUS SORDIDULUS*)

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In March 1866, Elliott Coues published a paper on the birds of southern Arizona (A List of the Birds of Fort Whipple, Arizona, Proc. Acad. Nat. Sci. Phila., March 1866, 18: 39-100) in which he commented on the variation that he noted in his series of skins of the western wood pewee. He states: "There has been made upon me an impression that there are two species. By far the majority of specimens are of the regulation *Richardsonii* type. A few others . . . differ in being all over of a more decided and uniform grayish brown; with less of olive above . . . the breast more purely gray. The bird may be well described as a miniature of *C. borealis*. Prof. Baird has always, to me, *verbis et literis*, indicated his decided conviction that there are two species in the collection."

Many years later Robert Ridgway (Bull. U. S. Nat'l Museum, No. 50, Part 4, 1907, pp. 521-524) expressed much the same opinion in discussing the characters of this species. In a footnote he comments as follows: "Although convinced, from intimate personal acquaintance of both in life, that this form and *M. virens* are specifically distinct I am at present unable to give a better diagnosis. The differences are more easily seen than described; but nevertheless it is often difficult to identify specimens as one or the other without doubt. It is not at all unlikely that this difficulty may be in part owing to the inclusion under the name *richardsonii* of what may be in reality two or three distinct forms; otherwise it is hard to account for the unusual variations of coloration noticeable in a large series. The group is an exceedingly difficult one, which

will require not only a very large amount of material, but also much time and patience for its satisfactory elucidation."

Phillips and Parkes (Condor, 57(4): 244-246, July, Aug. 1955) comment on the fact that uncertainty has always existed as to the type of *Contopus richardsonii* (*Tyrannula richardsonii* Swainson) and that study on their part has convinced them that the type specimen, no longer extant, was actually a Phoebe (*Sayornis phoebe*) and not a *Contopus*. They base their conclusions on Swainson's plate (Fauna Bor. Am. 1831: 146), representing an immature bird, stating that it "bears little or no particular resemblance to juvenal plumage *Contopus*," and also on the measurements given that are those of *Sayornis*. This would place *richardsonii* in the synonymy of *Sayornis phoebe*, and in its place they suggest *veliei*, a name somewhat hesitantly suggested by Coues should the Arizona bird be considered distinct. This suggestion was subsequently approved by the A.O.U. Committee on Nomenclature, and appears in the 1957 Check-List.

In connection with a detailed report on the birds of Idaho, I had occasion to examine critically a series of western wood pewees personally collected in various parts of this state. Not only did they appear to differ in appearance from specimens of *veliei* from east of the Continental Divide, but in the large series of *Contopus sordidulus* available in the collections of the National Museum, the considerable variation noted by both Coues and Ridgway was clearly evident. It appeared desirable, therefore, to compare breeding birds from throughout the range of this species in the United States. Arranged geographically it was apparent that not only did the western wood pewees of the Columbia Basin represent a distinct and undescribed race, but that, as suspected by both Coues and Ridgway, there are two races occurring within the present accepted range of *veliei* as given in the 1957 Check-List. Accordingly, *Contopus sordidulus* north of the Mexican border is represented by four recognizable races; these are as follows:

Contopus sordidulus veliei Coues

Characters: Upper parts fuscous-olive; throat grayish white, tinged with yellow; chest and sides of breast dark gray; belly pale yellow; under tail coverts whitish.

Measurements: Adult male (8 breeding specimens from Arizona): wing 82–89 (86.5) mm; tail 61–67 (63.8); exposed culmen 11–12 (11.5). Adult female (8 breeding specimens from Arizona): wing 79–86.5 (82.1); tail 58–63 (60); exposed culmen 10–12.5 (11.1).

Type: Adult male No. 36938, U. S. National Museum, Fort Whipple (Prescott), Arizona, 10 August 1864; Dr. E. Coues, original number 522.

Distribution: Breeds from northern California, Nevada, Utah, and Colorado south through Arizona, New Mexico, and western Texas to northern Baja California, eastern Sonora, and northern Chihuahua. Migrates south at least to Panama and probably winters in South America.

Remarks: In commenting on the variation he noted in the series of specimens of the western wood pewee that he collected in Arizona, Coues called attention to the fact that the "majority" were characterized by the olive tone of the upper parts. Although he admitted being reluctant to describe a new race from the southwestern United States he nevertheless designated a type that he called *veliei*, with the type locality Fort Whipple. On rather inconclusive evidence, Phillips and Parkes (1955) reject Fort Whipple as the type locality, but as pointed out by Alexander Wetmore, in notes he has kindly placed at my disposal, they overlooked the specimen that had been selected by Coues. This bears a label on which is printed "Explorations in Arizona, Dr. Elliott Coues, U.S.A.," and on which Coues has written in his own handwriting "Contopus veliei Coues ♂ August 10/64," adding in parentheses after Fort Whipple "(Prescott)." It was entered in the Museum catalog in March 1865, so it appears certain that Coues had it available when he wrote his account under the heading *Contopus richardsonii*. In effect, therefore, Coues has designated definitely the type locality. This specimen, although showing evidences of "foxing," represents the olivaceous form typical of the breeding birds of Arizona, so Coues' name is applicable to this breeding population.

Specimens of Contopus sordidulus veliei examined: Total number 56 from the following localities: TEXAS: El Paso, 21 June 1889, ♀; Presidio County, 10 June 1890, ♂; Fort Hancock, 14 June 1893, ♂; Fort Clark, 14 May 1898, ♂; Tascosa, 4 June 1899, ♂; Marathon, 13 May 1901, ♂; 15 May 1901, ♀; 16 May 1901, ♀; 18 May 1901, ♂; Boquillas, 24 May 1901, ♂; Chisos Mts., 13 June 1901, ♀; Frijole, 29 April 1939, ♂. ARIZONA: Fort Verde, 24 May 1884, ♂; Huachuca Mts., 4 May 1888, ♂; Rice, 20 May 1916, ♂; Madera Canyon, Santa Cruz County, 6 August 1918, ♀; Maricopa County, 10 June 1918, ♂; Yuma County, 29 May 1918, ♂; Mayer, 23 May 1927, ♀; 24 May 1927, 2 ♂♂; 26 May 1927, ♂; 29 May 1927, ♀; Lukachukai Mts., 21 June 1927, ♂. NEW MEXICO: Capitan Mts., 15 July 1903, ♂; Tres Piedras, 31 July 1904, ♀; Animas Peak, Grant County, 27 July 1908, ♂; Zuni Mts., 16 June 1909, ♀. CALIFORNIA: Mendocino County, 4 June 1889, ♂; Shasta County 9 June 1906, ♂; Mt. Veeder, 23 August 1909, ♀; Nevada City, 27 May 1911, ♂; Truckee, 10 August 1940, ♀. NEVADA: Glenbrook, 28 May 1889, ♀; Mt. Magruder, 4 June 1891, ♂; Peavine, 1 June 1898, ♀; Elko, 3 June 1898, ♂. UTAH: Pinto, Washington County, 14 June 1938, ♀; 18 June

1938, ♀; E. Pine Valley, Washington County, 15 June 1938, ♂; Silver Lake P. O., Salt Lake County, 12 June 1943, ♂; 19 June 1943, ♀; 26 June 1943, ♂; Midway Fish Hatcheries, Wasatch County, 4 June 1944, ♂; 7 June 1944, ♂; Big Glade, Wasatch County, 20 June 1946, ♂; Posy Lake, Garfield County, 10 June 1952, ♀; Skull Valley, Tooele County, 14 June 1954, ♀; Spring Canyon, Wayne County, 26 June 1956, ♀. COLORADO: Ft. Garland, 6 June 1873, ♂; Grand Junction, 28 June 1893, ♂; Granby, 10 June 1910, ♀; Lake Eldora, 26 June 1910, ♂; Boulder County, 29 June 1933, ♀; 1 July 1933, ♂. PANAMA CANAL ZONE: 12 October 1953, ♂.

***Contopus sordidulus amplus*, new subspecies**

Characters: Similar to *veliei* but upper parts darker, and distinctly more brownish, less olivaceous; yellow of belly paler and approaching dull white in extreme specimens; wing and tail longer.

Measurements: Adult male (10 breeding specimens from Wyoming and Montana): wing 89–93 (90.8) mm; tail 65–71 (67.6); exposed culmen 10–13 (12). Adult female (6 breeding specimens from Wyoming and Montana): wing 82–88 (85.3) mm; tail 63–67 (64.5); exposed culmen 10–12 (11.2).

Type: Adult male No. 463925, U. S. National Museum (Fish and Wildlife Service collection), Havre, Montana, 12 August 1955; Thomas D. Burleigh, original number 16316.

Distribution: Breeds from central Alaska, southern Mackenzie, Saskatchewan, and southern Manitoba south through British Columbia and eastern Montana to Wyoming and in western North Dakota and extreme western South Dakota. Migrates through Costa Rica and Panama, and probably winters in South America.

Remarks: Being a late migrant in the spring, *amplus* can be found well south of its breeding range at a time when its occurrence then would suggest nesting. It was this fact that caused the uncertainty as to the actual characters of the breeding wood pewees in Arizona when Coues, and later Ridgway, examined the series of presumably breeding birds, and noted the considerable variation in color. It is the latter part of May before western wood pewees can be found in any numbers on their more northern breeding grounds, and even at this late date belated individuals of *amplus* doubtless occur within the range of *veliei*.

Specimens of Contopus sordidulus amplus examined: Total number 28, from the following localities: MONTANA: Ft. Keogh, 16 June 1889, no sex; Glasgow, 18 June 1910, ♀; 21 June 1910, ♂; Powder River, 15 June 1916, ♂; Moorhead, 22 June 1916, ♀; Crow Agency, 11 July 1916, ♂; Dillon, 9 August 1917, ♂; Big Timber, 13 June 1917, ♂; Terry, 10 June 1918, ♂; Miles City, 5 July 1918, ♂; Lismas, 28 June 1919, ♀; Havre, 12 August 1955, ♂. WYOMING: Greybull, 7 June 1910, 3 ♂♂; 8 June 1910, ♀, ♂; 10 June 1910, ♂; 13 June 1910, ♀; Bridge Peak, Sierra Madre Mts., 18 June 1911, ♀; 20 June 1911, ♂; Pinedale, 25 July 1911, ♀; Kendall, 28 July 1911, ♀. SOUTH DAKOTA: Buffalo Gap, 23

June 1888, ♂. ALASKA: Ft. Egbert, 19 June 1901, ♂. BRITISH COLUMBIA: Okanagan Landing, 13 May 1922, ♀; Bulkley Lake, 29 July 1949, ♀. COSTA RICA: Liberia, 30 October 1940, ♀. PANAMA CANAL ZONE: 30 September 1953, ♀; 9 October 1953, ♂.

Contopus sordidulus siccicola, new subspecies

Characters: This is the palest of the four races. It differs from both *veliei* and *amplus* in having the upper parts washed with gray, the gray of the under parts much paler and the yellow of the belly largely replaced with dull white. In size it is similar to *veliei*, being smaller in both wing and tail measurements than *amplus*.

Measurements: Adult male (10 breeding specimens from Idaho): wing 85–90 (87) mm; tail 62–65.5 (63); exposed culmen 11–13 (11.9). Adult female (6 breeding specimens from Idaho and eastern Washington): wing 83–86 (84.5) mm; tail 60–65 (63.3); exposed culmen 11–12 (11.5).

Type: Adult male No. 420775, U. S. National Museum (Fish and Wildlife Service collection), Potlatch, Idaho, 19 May 1952, Thomas D. Burleigh, original number 14647.

Distribution: Breeds in southern British Columbia east of the coast ranges, Washington east of the Cascades, Idaho, Oregon, and western Montana west of the Continental Divide. No specimens seen from south of the breeding area indicative of distribution in migration or winter.

Remarks: In its characters, notably the gray of the upper parts, *siccicola* suggests the racial differences evident in the races of other species described from this region. This emphasizes the significance of the western slopes of the northern Rocky Mountains as an area of morphological differentiation. In its distribution this new race is characterized by its disregard for altitude. In Idaho it has been found nesting at Lewiston, Nez Perce County, at an altitude of 840 feet (the lowest in the state), and at Galena Summit, Blaine County, at an altitude of 8,795 feet. Specimens taken at these extreme limits show no appreciable differences in color or size, and are in every respect typical of *siccicola*.

Specimens of Contopus sordidulus siccicola examined: Total number 39, from the following localities: IDAHO: Moscow, 15 May 1948, ♂; 20 June 1948, ♂; 10 July 1948, ♂; 23 July 1948, 2 imm. ♂♂; 17 July 1949, ♂; 25 August 1949, ♂ imm.; 30 August 1949, ♀ imm.; 5 September 1949, ♂ imm.; 7 September 1949, ♂ imm.; 18 May 1950, ♂; 25 July 1951, ♀; 14 September 1951, ♂ imm.; 18 September 1951, ♀ imm.; 8 July 1952, ♂; 18 May 1953, ♂; 7 September 1957, ♂ imm.; 16 September 1957, ♂ imm.; Potlatch, 26 May 1949, ♂; 19 May 1952, ♂; Lewiston, 21 June 1950, ♂; 28 July 1957, ♀, ♂ imm.; Galena Summit, Blaine County, 26 June 1950, ♀; MacKay, Custer County, 13 July 1958, ♀. WASHINGTON: Bly, 3 June 1919, ♀; Grand Ronde River, 14 June 1919, ♀; Anatone, 26 June 1919, ♀; Ferry Lake, 16 June 1942, ♀; Palouse, 24 July 1949, ♂; Pullman, 8 June 1951, ♀; Spokane, 21 July 1955, ♀; 7 August 1958, ♀. OREGON: Disaster Peak, 14 June 1915, ♀; Meacham,

21 July 1915, no sex indicated; Homestead, 4 June 1916, ♂; 6 June 1916, ♀; Reston, 5 July 1916, ♀; Portland, 30 May 1954, ♀.

Contopus sordidulus saturatus Bishop

Characters: This is the darkest of the four races. It most closely resembles *amplus* in the brown coloration of the upper parts, and is the least olivaceous of the four races. Compared with *amplus* the brown of the upper parts is noticeably darker, the gray of the under parts darker and more extensive. In size it is similar to *veliei*, both the wing and tail being shorter than in *amplus*.

Measurements: Adult male (5 breeding specimens from Oregon, Washington, and British Columbia): wing 86–90 (88.6) mm; tail 61–66.5 (64); exposed culmen 10–12 (11.3). Adult female (5 breeding specimens from Washington and Oregon): wing 82.5–85 (84.2); tail 60–64 (61.5); exposed culmen 10–11 (10.6).

Type: Adult male, Chicago Natural History Museum, Haines, Alaska, 2 June 1899; L. B. Bishop, original number 4142.

Distribution: Breeds from southeastern Alaska south through western British Columbia, western Washington, including the Cascade Mountain area, western Oregon, and possibly the coast region of northwestern California. Migrates southward through Central America (Guatemala), probably wintering in South America.

Remarks: For many years after it was described, *saturatus* was not considered a valid race by the Committee on Classification and Nomenclature of the A.O.U. This was probably due to the uncertainty resulting from the variation noted in supposedly breeding birds from various areas in the western United States. This situation results from the late date in the spring when transients can still be found well south of their breeding range. In common with so many species occurring in the northwest coastal area, *Contopus sordidulus* is characterized by a dark coloration and is quite distinct from breeding populations of this species east of the Cascades.

Specimens of Contopus sordidulus saturatus examined: Total number 15 from the following localities: ALASKA: Lake Mansfield, 18 July 1921, ♀. BRITISH COLUMBIA: Hazelton, 21 July 1918, ♂. WASHINGTON: Mt. Vernon, 26 June 1897, ♂, ♀; Blewett, 23 June 1941, ♀; Soda Springs, 23 June 1946, ♂; Yakima, 31 August 1951, ♂ imm. OREGON: Fort Klamath, 15 July 1883, ♂; Diamond Lake, 10 August 1896, ♀; Tillamook, 3 July 1897, ♀; Maury Mts., 30 June 1896, ♂; Roseburg, 12 July 1955, ♀. CALIFORNIA: Pacific Grove, 8 June 1909, ♀. GUATEMALA: Alotenango, east base of Volcan de Fuego, 5 November 1936, ♂; Panajachel, 14 November 1936, ♀.

PROCEEDINGS
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PRELIMINARY DESCRIPTIONS OF ONE NEW GENUS,
TWELVE NEW SPECIES AND THREE NEW
SUBSPECIES OF SCYLLARID LOBSTERS
(CRUSTACEA DECAPODA MACRURA)

By L. B. HOLTHUIS

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A study of the Scyllarid collections of the U. S. National Museum and some other institutions resulted in the discovery of a relatively great number of undescribed or unnamed taxa. As the publication of a proposed world-wide revision of the entire family containing full descriptions of these taxa will take some time, it was thought advisable to provide here preliminary descriptions of these new species and subspecies and of the new genus in order to make them known without delay.

***Ibacus ciliatus pubescens*, new subspecies**

This subspecies is very close to the typical *Ibacus ciliatus ciliatus* (Von Siebold, 1824), but differs in that the adult specimens have the dorsal surface of the carapace and the abdomen covered with a short and dense pubescence; in the typical form this surface is quite naked in the adults. Furthermore the number of posterolateral teeth of the carapace (i.e., the teeth of the lateral margin behind the cervical incision) varies between 11 and 13 in the new subspecies, being usually 12. In the typical subspecies this number varies between 10 and 12, being usually 11.

Distribution: The typical subspecies is known from Japan, China, Formosa, and the Philippines, the new subspecies has so far only been found in the Philippines (depth 52 to 391 m).

Holotype: A male specimen from "Albatross" Station D 5394, near Talajit Island, Philippines, 12° 00' 30" N, 124° 05' 36" E, 13 March 1909 (U.S.N.M. Cat. No. Crust. 104285).

***Parribacus caledonicus*, new species**

The rostrum bears a blunt dorsal tooth. The posterior of the two anterolateral teeth of the carapace is smaller than the anterior. The anterior part of the second to fifth abdominal somites (namely the part which

disappears under the previous somite when the abdomen is fully stretched) is provided with distinct tubercles which have a fringe of very short stiff hairs along the posterior margin. The transverse groove between the two halves of the abdominal somites is rather narrow and filled with short stiff hairs and tubercles. The median carina on the posterior half of the second to fifth abdominal somites is hardly if at all elevated above the level of the somite itself, at least in large specimens. The fourth segment of the antenna is usually provided with 7, seldom with 6, teeth on the outer margin (the final tooth of the segment not included). The pereopods are shorter and less slender than those of *Parribacus antarcticus* (Lund, 1793). The first abdominal somite shows dorsally in each half two large dark red lateral spots, which have an irregular outline and are partly fused anteriorly; a small red spot is present in the median line of the somite. All these spots are situated near the posterior margin; no other red spots are present on the somite.

Distribution: So far the species is only known from New Caledonia where it is found on the reefs, being rather common there.

Holotype: A female (c.l. 72 mm) from Ile des Pins, April–May 1960, leg. Dr. Merlet (Rijksmuseum van Natuurlijke Historie, Cat. No. Crust. D. 14506).

***Parribacus scarlatinus*, new species**

The rostrum bears a small sharp dorsal tooth. The posterior antero-lateral tooth of the carapace is slightly less strong than the anterior. The anterior part of the second to fifth abdominal somites is smooth and naked, showing at most a few inconspicuous reticular grooves. The transverse groove between the two halves of these abdominal somites is narrow and filled with short hairs and tubercles. The median carina of the second to fifth abdominal somites is hardly at all elevated in the adults. The fourth antennal segment bears usually 6, seldom 5, external teeth (the final tooth of the segment excluded). The pereopods are slender. The first abdominal somite shows dorsally five red spots on the posterior margin; no spots are placed in front of these five. The spots are irregular in outline, not sharply defined and without a dark ring.

Distribution: Kapingamarangi Atoll, Marshall, Gilbert, and Phoenix Islands.

Holotype: A male (c.l. 66 mm) from Enderbury Island, Phoenix Archipelago, 3° 08' 29.7" S, 171° 05' 34.4" W, 19 May 1939, L. P. Schultz (U.S.N.M. Cat. No. Crust. 100826).

***Parribacus japonicus*, new species**

The rostrum bears no dorsal tooth. The posterior of the two antero-lateral teeth of the carapace is only slightly smaller than the anterior. The anterior half of the second to fifth abdominal somites is practically smooth, sometimes with a few very shallow reticular grooves. The groove between the two halves of these somites is narrow and filled with short hairs and tubercles. The median carina of these somites is low and hardly

at all elevated above the surface of the somites. The fourth antennal segment has five external teeth (not including the final tooth of the segment). The pereopods are slender. The first abdominal somite shows dorsally one small median and on each half two large lateral dark colored spots.

Distribution: Japan.

Holotype: A male (c.l. 61 mm) from Kururi District, Tokyo Bay, March 1893, leg. F. Sakamoto (U.S.N.M. Cat. No. Crust. 18883).

***Scyllarus batei arabicus*, new subspecies**

This new subspecies is closely related to the typical *Scyllarus batei* Holthuis, 1946, but differs mainly in the following points. The branchial region of the carapace is inflated so that the branchio-cardiac groove becomes distinct. The transverse groove on the first abdominal somite is well developed and only narrowly interrupted by the narrow median carina.

The present new form has been reported upon under the name *Scyllarus orientalis* (Bate) by Ramadan (1938, Sci. Rep. John Murray Exped., 5(5): 126, Fig. 2) and under the name *Arctus orientalis* Bate by Alcock and Anderson (1894, Journ. Asiat. Soc. Bengal, 63(2): 165) and Alcock (1901, Descr. Catal. Indian Deep Sea Crust. Macr. Anom. p. 181).

Distribution: The typical subspecies is known from the Philippines. The new subspecies inhabits the Arabian Sea.

Holotype: A specimen from the Gulf of Aden (13° 16' – 13° 16' 36" N, 46° 20' 24" – 46° 14' E, depth 220 m, "John Murray" Expedition Sta. 194, 7 May 1934); the specimen forms part of the collection of the British Museum, London.

***Scyllarus modestus*, new species**

The material from Hawaii which Rathbun (1906, Bull. U. S. Fish Comm., 23(3): 896, pl. 18, Fig. 2) identified as *Scyllarus martensi* Pfeffer proved to be distinct from, but nevertheless closely related to that species. The Hawaiian form differs from *S. martensii* in that the longitudinal grooves on the first abdominal somite are curved and partly branched instead of being straight and unbranched. Furthermore the median carinae of the second to fifth abdominal somites are hardly raised. The anterior half of the second to fifth somites is smooth in the present species, while in *S. martensii* they bear a transverse ciliated groove. The distal antennal segment bears 7 teeth in *S. modestus*, 5 in *S. martensii*.

Distribution: Hawaiian Islands; 32–43, 43, and 53–220 fathoms.

Holotype: An ovigerous female (c.l. 14 mm) from Mokuhooniki Islet N.3 E., 16.6', Auau Channel, 12 April 1902, "Albatross" Sta. D. 3872 (U.S.N.M. Cat. No. Crust. 30263).

***Scyllarus aesopius*, new species**

This is another species related to *Scyllarus martensii* but differing in

certain respects. A small but distinct rostral tooth is present. The longitudinal grooves of the first abdominal somite are not straight, but curved and branched. The anterior half of the second to fifth abdominal somites shows two or more transverse rows of tubercles. The median ridge of the second and third abdominal somites are conspicuously higher than those of the fourth; the ridge of the third somite being highest. The distal antennal segment bears seven broad anterior teeth which have the anterior margin truncate.

Holotype: A male (c.l. 11 mm) from the Sulu Archipelago, Philippines, 4° 58' 20" N, 119° 50' 30" E, 9 or 18 fathoms, 24 February 1908, "Albatross" Sta. D. 5165 (U.S.N.M. Cat. No. Crust. 104528). No other specimens of this species have so far been examined.

***Scyllarus cultrifer meridionalis*, new subspecies**

The species *Scyllarus cultrifer* (Ortmann, 1897) needs to be divided into two subspecies. Ortmann's (1897, Zool. Jb. Syst., 10: 272) original description of *Arctus cultrifer* is a composite one, being based on its two subspecies and on *Scyllarus bicuspidatus* (De Man). By selecting the lectotype of *Arctus cultrifer* Ortmann from among the material collected by Döderlein from Tokyo Bay in 1880-1881, which material was reported upon by Ortmann, the Japanese form of the present species becomes the nominate subspecies. The southern subspecies is described here as new. This southern form in all probability is the one described by Bate (1888, Rep. Voy. Challenger, Zool., 24: 66, Pl. 9, Fig. 3) and Barnard (1926, Trans. Roy. Soc. S. Afr., 13: 122, Pl. 10) under the names *Arctus* or *Scyllarus sordidus* and later reported upon by Barnard (1947, Ann. Mag. Nat. Hist. (11)13: 382; 1950, Ann. S. Afr. Mus., 38: 577, Fig. 104a) as *Scyllarus cultrifer*.

The new subspecies *S. c. meridionalis* differs from *S. cultrifer cultrifer* in that the posterior part of the postrostral carina lacks squamiform sculpture but instead has a number of transverse hairy ridges. The posterior half of the first abdominal somite in *S. c. meridionalis* possesses more longitudinal grooves, every other pair of which is connected by transverse grooves. The fourth abdominal somite shows no median incision in the posterior margin. The anterior part of the sternum is wider than in *S. c. cultrifer* and is not gutter-like depressed, showing only a median longitudinal groove.

Distribution: If Bate's and Barnard's specimens belong to this form, it inhabits the Philippines, the Moluccas, and S. E. Africa.

Holotype: A female (c.l. 22 mm) from the Philippines, 11° 35' 12" N, 124° 13' 48" E, 114 fathoms, 15 March 1909, "Albatross" Sta. D. 5398 (U.S.N.M. Cat. No. Crust. 104525).

***Scyllarus timidus*, new species**

In discussing the material which he identified with *Scyllarus cultrifer* (Ortmann), Holthuis (1946, Temminckia, 7: 93, Pl. 8, Figs. c-e) mentioned several differences with the descriptions of Ortmann's species

given by previous authors. Actual comparison of the true *S. cultrifer* with Holthuis' form showed that the differences between the two are of a specific nature. The name *Scyllarus timidus* is proposed here for the form described and figured by Holthuis (1946). This species indeed is closest related to *S. cultrifer* but may at once be distinguished from it by lacking the sharp anteroventral tooth on the propodus of the third pereopod.

Distribution: Sulu Archipelago (Philippines), and Hawaii.

Holotype: A male (c.l. 18 mm) from Basilan Strait, Sulu Archipelago, 6° 58' N, 121° 52.5' E, depth 72–80 m, 5 September 1929, "Snellius" Expedition Sta. 60° (Rijksmuseum van Natuurlijke Historie, Cat. No. Crust. D. 14507).

Scyllarus nearctus, new species

The specimens reported under the name *Scyllarus arctus* from American Atlantic waters prove to be closely related to, but nevertheless distinct from the true European *Scyllarus arctus* (Linnaeus, 1758). These American specimens represent a new species for which the name *Scyllarus nearctus* is proposed here. The differences from the true *Scyllarus arctus* are the following: The rostral tooth of the carapace is directed forward and hardly at all upward. The cardiac tooth and the posterior postrostral carina are less conspicuous. The abdominal pleurae are more slender, the anterior margin of the pleuron of the second somite is less convex. The anterior margin of the antennular somite bears only two teeth and entirely lacks the two to four additional smaller teeth found in *S. arctus*. The teeth of the distal antennal segment have the tips more narrowly rounded and the spaces between them are wider. The color of preserved specimens is very pale cream with a darker color pattern.

Distribution: Atlantic coast of America from North Carolina (U.S.A.) to São Paulo State (Brazil); depth 30–100 fathoms.

Holotype: A female (c.l. 20 mm) from south of Dry Tortugas, Florida, 28 July 1932, W. L. Schmitt (U.S.N.M. Cat. No. Crust. 104502).

The specimen reported by Rathbun (1900, Proc. U. S. Nat. Mus., 22: 309) from Mazatlan, west coast of Mexico, proves to be a typical *S. arctus*, and is probably labelled incorrectly as to the locality.

Scyllarus ornatus, new species

Reexamination of material from off the Arabian coast (18° 03.5' N, 57° 02.5' E, depth 38 m) collected by the "John Murray" Expedition and reported upon by Ramadan (1938, Sci. Rep. John Murray Exped. 5(5): 126) as *Scyllarus arctus paradoxus* Miers, shows that it represents a new species. This species is indeed very close to *Scyllarus paradoxus* Miers but differs in certain points. *Scyllarus ornatus* is a rather small species (c.l. 7–8 mm). It differs from *S. paradoxus* by possessing a distinct rostral tooth. The anterior margin of the sternum shows a U- rather than a V-shaped emargination. The posterolateral angles of the thoracic sternum are not produced tooth-like in the male. In the pres-

ence of a strong pointed median tooth on the last thoracic sternite, the present species resembles *S. paradoxus* and differs from most other species of the genus.

Syntypes: The species so far is known only from the specimens which were collected by the "John Murray" Expedition at its Sta. 45, and at present are preserved in the collection of the British Museum, London.

***Scyllarus chacei*, new species**

Under the name *Scyllarus americanus* (Smith) two species have currently been confused. The true *Scyllarus americanus* is known to inhabit the Atlantic coast of the U.S.A. from North Carolina to Florida, and the eastern Gulf of Mexico, including Cuba; it has been found in depths between 0 and 19 (usually between 3 and 12) fathoms. The other species, for which the name *Scyllarus chacei* is proposed here, has a far wider range, which extends from North Carolina to northeastern Brazil and throughout the Caribbean area; it is found in greater depths (usually 19 to 31 fathoms).

Scyllarus chacei has been extensively described and well figured by Bouvier (1925, Mem. Mus. Comp. Zool. Harvard, 47(5): 448-450, Pl. 7, Fig 3), who identified his specimen as *Scyllarus americanus*, though he already noticed differences between it and a type specimen of *Scyllarus americanus*. Fenner A. Chace, Jr., Curator, Division of Marine Invertebrates, U. S. National Museum, was the first to draw my attention to the fact that the differences between this form and *S. americanus* are of a specific nature; it is therefore a great pleasure for me to dedicate this new species to him.

The main differences between *Scyllarus chacei* and *S. americanus* are the following: The pregastric tooth of the carapace (i.e., the first median tooth following the rostral tooth) is practically always bilobed in the latter species, while in *S. chacei* it is broadly rounded anteriorly, never being incised there. Between the posterior marginal groove of the carapace and the posterior margin there are two, seldom three, distinct parallel transverse grooves in *S. chacei*, whereas *S. americanus* usually has a single distinct groove. In *S. americanus* the first to fourth abdominal somites show a deep, narrow, median incision in the posterior margin; this incision is very shallow in *S. chacei*. The fourth abdominal somite is more or less ridge-like elevated in the median line in *S. americanus*; no such ridge is present in *S. chacei*.

Holotype: A female specimen (c.l. 10 mm) from north-northwest of the mouth of the Marowijne River, about 20 miles off the coast of Suriname, 29 April-3 May 1957, third voyage of the "Coquette" (Rijksmuseum van Natuurlijke Historie, Cat. No. Crust. D. 13169).

***Scyllarides astori*, new species**

The dorsal surface of the carapace is rather evenly arched, showing hardly any elevations or teeth; its grooves are wide and not very deep. The cervical incision of the lateral margin is absent or indistinct. There

is no median carina on the second to fifth abdominal somites, though there may be a median row of larger tubercles there. The basal part of the posterior margin of the pleura of the second abdominal somite is concave. The carpus of the first pereiopod shows no dorsal carinae, and is not conspicuously swollen. The sternite of the first abdominal somite is serrate in the male, but the median incision is not deeper than the others. The eyes show longitudinal color stripes on the peduncle. The smooth area of the first abdominal somite has two large, almost circular lateral spots of a dark red color. The area between these spots is yellowish with numerous much smaller red spots, which are placed closest together in the median area but do not actually form a big spot there.

The species is closest to *Scyllarides aequinoctialis* (Lund) but may immediately be distinguished from that species by the shape of the carpus of the first leg, which is swollen basally in *S. aequinoctialis*, and by the different coloration of the first abdominal somite, which in that species shows a horseshoe-shaped median dark spot.

Distribution: The species proves to be rather common in the Galapagos Archipelago whence a fairly great number of adults and postlarvae have been collected. Apart from a postlarva found 200 miles north of Clipperton Island, the species is not known from outside the Galapagos.

Holotype: A male (c.l. 116 mm) from Post Office Bay, Charles Island, Galapagos Archipelago, 5 February 1933, Allan Hancock Expedition (U.S.N.M. Cat. No. Crust. 104557).

***Scyllarides delfosi*, new species**

This species has been figured and discussed by Holthuis (1959, Zool. Verhand. Leiden 44: 127, Pl. 3, Fig. 2), who with some doubt identified his specimen as *Scyllarides americanus* Verrill, 1922. *Scyllarides delfosi* differs from the true *S. americanus*—the correct name of which is *Scyllarides nodifer* (Stimpson, 1866)—in the following points. The median carinae of the abdomen are absent in the new species. The fourth abdominal somite of juvenile specimens of *S. nodifer* forms a conspicuous hump, while such a hump is absent in the juvenile specimen of *S. delfosi* seen by me. The new species agrees with *S. nodifer*, and differs from other species in which the median carinae of the abdomen are absent, in that there is a longitudinal row of large pointed tubercles on the branchial region of the carapace.

Distribution: Off British and Dutch Guiana, South America; depth 23–44 fathoms.

Holotype: The male specimen (c.l. 63 mm) from off the Suriname coast (6° 41' N, 55° 26.5' W, depth 23 fathoms, bottom mud, shells, and coral) dealt with by Holthuis, 1959 (Rijksmuseum van Natuurlijke Historie, Cat. No. Crust. D. 12735).

The new species is named in honor of J. A. G. Delfos of the Rijksmuseum van Natuurlijke Historie, Leiden, in recognition of his excellent work in the interest of the division of Crustacea of the Museum.

Arctides, new genus

The body is rather highly arched and not depressed, resembling thereby that of *Scyllarides* Gill, 1899. The carapace shows a shallow cervical, but no postcervical incision in the lateral margin. The first abdominal somite bears an uninterrupted transverse dorsal groove. The following somites show complicated sculpture in the posterior half. The distal antennal segment bears many distinct teeth. The mouth parts and the branchial formula are identical with those of *Scyllarides*.

So far the species of this genus have been placed in the genus *Scyllarides*, which indeed is closely related, but which differs in the characters of the abdomen and antennae mentioned above.

Distribution: Atlantic (Bermuda, West Africa) and Pacific regions (Eastern Australia).

Type species: *Scyllarus guineensis* Spengler, 1799.

The only other species of this genus known so far is the following new species.

Arctides antipodarum, new species

Until 1922 both the Australian and Bermudan specimens of *Arctides* were generally referred to as *Scyllarus sculptus* Latreille. Then Verrill (1922, Trans. Connecticut Acad. Arts Sci., 26: 30) pointed to differences between the two forms and described the Atlantic one as a new variety *bermudensis*. A comparison of the various descriptions with material of both species makes it clear that *Scyllarus guineensis* Spengler (1799), *Scyllarus sculptus* Latreille (1818) and *Scyllarides sculptus bermudensis* Verrill (1922) are all three based on the Atlantic form and that no name is available for the Australian form, for which the name *antipodarum* is now proposed.

An extensive, accurate, and illustrated description of *Arctides antipodarum* was provided by Whitelegge (1899, Rec. Australian Mus., 3(6): 155-162, pl. 29) who indicated the species by the name *Scyllarus sculptus*. The differences between *Arctides antipodarum* and *A. guineensis* are slight. In *A. antipodarum* the teeth on the distal segment of the antenna are far smaller than in *A. guineensis*, especially those on the inner half; the difference in size between the inner and outer teeth is far less conspicuous than in the type species of the genus. The abdomen of *A. antipodarum* is more uniformly tuberculated than that of *A. guineensis*; because of this tuberculation the characteristic sculpture pattern of the abdomen is rather inconspicuous in the new species.

Distribution: East coast of Australia.

Holotype: A male (c.l. 102 mm) from off Malabar, New South Wales, Australia, depth 80 fathoms, March 1956, leg. A. A. Racek (Rijksmuseum van Natuurlijke Historie, Cat. No. Crust. D. 10648).

PROCEEDINGS
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NOTES ON THE OSBORN MALLOPHAGA TYPES

BY K. C. EMERSON
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For more than ten years, I have conducted an extensive search for the type material of the Mallophaga species described by Herbert Osborn. All possible clues as to the location of this material, given in his published papers, have been explored. Of the forty-one species described by Osborn, the holotype or syntypes for thirty-four species have been located.

Some syntypes are known to be at Stanford University, and are not reported in this paper. When visiting with the late G. F. Ferris in January 1941, I examined syntypes of *Colpocephalum kelloggi* Osborn. Since the death of Ferris, the Mallophaga Collection at Stanford University has not been placed in proper order so that it is possible to determine if other Osborn type material is present. I suspect that if there is other Osborn type material in that collection, it will be a portion of some of the larger series, and not be type material of the seven species still unaccounted for. Osborn apparently distributed to Kellogg, at Stanford University, and to the U. S. National Museum duplicates from the larger series that he collected. For the smaller series, he either retained the material in his collection, or returned it to the individuals and institutions mentioned in his papers. Therefore, it is believed that types for seven species are no longer in existence.

In the designation of lectotypes, first preference has been given to the material at Ohio State University, since this was Osborn's Collection. The slides in the Ohio State University Collection have small "type" or "cotype" labels which apparently were added sometime after the descriptions were published, as they do not correspond to published data and are not present on the slides in other collections. Most of the ma-

terial from the Boston Society of Natural History is now in the Museum of Comparative Zoology. Some of the material provided by L. Bruner is now in the collection of M. A. Carriker. None of the material supplied by C. F. Baker is now at Colorado State University. The material originally from Iowa State University and Cornell University, which is unaccounted for, is assumed to be lost. Museum authorities at these two institutions have been unable to locate the specimens.

All hosts have been verified by comparison with known collections, and except as noted are correct as given in the original description.

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Colpocephalum kelloggi Osborn. 1902. Ohio Naturalist, 2: 175, pl. II, Fig. 2.

Osborn recorded the type series from Ames, Iowa, and Lincoln, Nebraska; and illustrated a female in the description. Ohio State University has two slides from Lincoln, Nebraska, which have a total of seven males, fourteen females and five nymphs; and from Ames, Iowa, there are three slides with a total of five males, five females and ten nymphs. The female on a slide with four nymphs from Ames, Iowa, dated 21 April 1890 is designated Lectotype.

Present status: *Colpocephalum kelloggi* Osborn, 1902.

Colpocephalum pectinatus Osborn. 1902. Ohio Naturalist, 2: 201, pl. 14, Fig. 2.

Osborn did not record the number of specimens in the type series. He illustrated a female. Ohio State University has five females and eight nymphs. The female located in the lower right portion of the slide is designated Lectotype.

Present status: *Kurodaia pectinata* (Osborn, 1902).

Docophorus agelaii Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 220.

Osborn did not record the number of specimens in the type series. Ohio State University has one male, three females and three nymphs. The male in the Ohio State University Collection is designated Lecto-

type. M. A. Carriker has one male. The Museum of Comparative Zoology has slide number 194 with one nymph; and slide number 195 with one male, one female, and one nymph.

Present status: *Philopterus agelaii* (Osborn, 1896).

Docophorus barbatus Osborn. 1902. Ohio Naturalist, 2: 201, pl. 14, Fig. 1.

Osborn did not record the number of specimens in the type series. He illustrated a female. Emerson (1955) noted that the true host is *Asio otus wilsonianus* (Lesson). Ohio State University has two slides. One slide with four males, four females and two nymphs. The other slide has two males, two females and one nymph. The female located in the upper right portion of the latter mentioned slide is designated Lectotype.

Present status: *Strigiphilus barbatus* (Osborn, 1902).

Docophorus bubonis Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 219.

Ohio State University has a slide with one male and one female, which are the two specimens recorded by Osborn. The male is designated Lectotype. Two species of *Strigiphilus* are found on *Bubo virginianus* (Gmelin). Osborn's types are conspecific with *S. oculatus* (Rudow, 1870), therefore the form with the narrow forehead found on this host has not been described. Carriker (1958) designated specimens as "neoparatypes" of *S. oculatus* (Rudow, 1870). Since he did not establish a neotype, his action is not valid.

Present status: A synonym of *Strigiphilus oculatus* (Rudow, 1870).

Docophorus coccygi Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 222, Fig. 143.

Osborn did not record the number of specimens in the type series. A female was illustrated. Ohio State University has one slide with two males, two females, and one nymph with collection date of 30 May 1890. The female located in the bottom center of the slide is designated Lectotype. M. A. Carriker has two males with collection date of 29 May 1890.

Present status: *Cuculoecus coccygii* (Osborn, 1896).

Docophorus corvi Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 220, Fig. 142. (not Linnaeus, 1758).

Philopterus osborni Edwards. 1952. Psyche, 59: 27. (Nomen novum).

Osborn did not record the number of specimens in the type series. A female was illustrated. The Museum of Comparative Zoology has slide number 27344(242) with one female and two nymphs, slide number 27344(243) with one male and one nymph, and slide number 27344(248) with three females. The female on slide number 27344(242) is designated Lectotype. Ohio State University has one male with collection data "Crow, Ft. Collins, Colorado, Monroe Co., Ind., 7-12-92, R. M. Harve, 35, C. F. B." Even though this slide bears a "type" label, it is not a syntype because there is no reference to it in the original description.

Present status: *Philopterus ocellatus osborni* Edwards, 1952.

Docophorus fusco-ventralis Osborn. 1896. Bull. U. S. Ent. (n.s.), 5: 221.

Osborn did not record the number of specimens in the type series. The Museum of Comparative Zoology has slide number 27342(244) with two males, one female, and one nymph. The female on slide number 27342(244) is designated Lectotype. The Museum of Comparative Zoology also has slide number 27342(250) with two males, two females and two nymphs from "*Tyrannus (Muscicapa) atra*" which are not conspecific with the lectotype and bear collection data not mentioned in the description. Therefore, the specimens on slide number 27342(250) are not syntypes despite the fact that the slide is labeled "type."

Present status: *Philopterus fuscoventralis* (Osborn, 1896).

Docophorus halioti Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 218.

Osborn did not record the number of specimens in the type series. Ohio State University has a slide with two females and one male. The male is designated Lectotype.

Present status: *Craspedorrhynchus halioti* (Osborn, 1896).

Docophorus minuto-trabeculatus Osborn. 1896. Bull. U. S. Bur. Ent., 5: 221.

The type material for this species could not be located. Hopkins and Clay (1952) consider it to be a synonym of *Rallicola advenus* (Kellogg, 1896).

Docophorus phaëtonus Osborn. 1890. In Howard, Proc. U. S. Nat. Museum, 12: 189.

The type material for this species could not be located. Hopkins and Clay (1952) consider the present status of this species to be *Saemundsonia phaëtona* (Osborn, 1890).

Docophorus quiscali Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 219, Fig. 141.

Osborn did not record the number of specimens in the type series. A female was illustrated. Ohio State University has a slide with one female and one nymph. The female is designated Lectotype.

Present status: *Philopterus quiscali* (Osborn, 1896).

Docophorus sialii Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 220.

Osborn did not record the number of specimens in the type series. Ohio State University has a slide with one male, two females, and four nymphs. The male is designated Lectotype. This slide bears a collection date of 21 March 1874.

Present status: *Philopterus sialii* (Osborn, 1896).

Docophorus speotyti Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 222, Fig. 144.

Osborn recorded one male and one female from Lincoln, Nebraska, and two males and two females from Fort Collins, Colorado. He illus-

trated a female. M. A. Carriker has one female collected at Lincoln, Nebraska, 17 April 1890 which is designated Lectotype. Ohio State University has one male from Lincoln, Nebraska, collected on 16 April 1890. In addition, Ohio State University has four females with collection data "Burrowing Owl, Ft. Collins, Colo., 4-13-92, C. F. Baker Coll., CFB. 25." Either Osborn made a mistake in recording the sex of these specimens, or they are not syntypes. For that reason, the female in Carriker's Collection is designated Lectotype.

Present status: *Strigiphilus speotyti* (Osborn, 1896).

Lipeurus botaui Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 234.

Osborn did not record the number of specimens in the type series. Ohio State University has one female collected at Ames, Iowa. This specimen is considered the Holotype.

Present status: *Ardeicola botaui* (Osborn, 1896).

Lipeurus infuscatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 234, pl. II, Figs. e and f.

Osborn recorded four specimens, all of which are in the Museum of Comparative Zoology. Edwards (1952) discussed this material and designated the male on slide number 27343(334) as Lectotype.

Present status: *Rhynonirmus infuscatus* (Osborn, 1896).

Lipeurus marginalis Osborn. 1902. Ohio Naturalist, 2: 176.

Osborn recorded two females from Ames, Iowa. Ohio State University has a slide with two nymphs, which obviously would have been females upon reaching maturity. The specimen located on the bottom portion of the slide is designated Lectotype.

Present status: *Falcolipeurus marginalis* (Osborn, 1902).

Menopon alternatum Osborn. 1902. Ohio Naturalist, 2: 175, pl. II, Fig. 1.

Osborn recorded the type series as being from Ames, Iowa, and Lincoln, Nebraska; but did not note the number of specimens. He illustrated a male. Ohio State University has a slide with one male, one female, and one nymph collected at Lincoln, Nebraska, 23 June 1891. The male on this slide is designated Lectotype.

Present status: *Cuculiphilus alternatus* (Osborn, 1902).

Menopon expansum Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 245, pl. II, Fig. j.

Osborn recorded and illustrated a female on slide number 67. This specimen, on slide number 67, is in the Museum of Comparative Zoology. Although the host is given in the original description and on the slide as *Dolichonyx eryzivorus*, the specimen is not a species found on passerine hosts but is an *Austromenopon* and agrees perfectly with specimens of *A. aegialitidis* (Durrant, 1906) from *Charadrius vociferus* Linnaeus.

The draft International Rules of Zoological Nomenclature passed by

the 15th Int. Congress Zool. contains provision that a senior synonym which has been unused in the primary zoological literature for more than 50 years shall be considered a *nomen oblitum* and shall not be used to replace its junior synonym until after reference to the Commission, who will either place it on the Index of Rejected Names or on the Official List. *Menopon expansum*, having been unused for 64 years, comes under this provision and must not be used in place of *Austromenopon aegialitidis* (Durrant, 1906) in use for 54 years.

Menopon fusco-marginatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 245.

Osborn did not record the number of specimens in the type series. The Museum of Comparative Zoology has slide number 258 with one male, one female, and one nymph; slide number 264 with one male, and two females; and slide number 265 with one male and three nymphs. The male on slide number 264 is designated Lectotype.

Present status: *Myrsidea fuscomarginata* (Osborn, 1896).

Menopon interruptus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 245, pl. II, fig. h.

Osborn did not record the number of specimens in the type series. A male was illustrated. The Museum of Comparative Zoology has slide number 45 with one male; slide number 51 with one male, one female, and one nymph; slide number 142 with one male, one female, and one nymph; slide number 249 with three nymphs; slide number 257 with one male and two females; slide number 259 with one male, one female, and one nymph; slide number 260 with two males and one female; and slide number 261 with one male and two nymphs. The male on slide number 259 is designated Lectotype.

Present status: *Myrsidea interrupta* (Osborn, 1896).

Nirmus abruptus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 229, pl. II, Fig. c.

Osborn recorded one adult and one nymph, and illustrated a female. The Museum of Comparative Zoology has slide number 27338(307) with one female and one nymph. Host data on the slide is "*Perdix americana*." The female is designated Lectotype. Hopkins and Clay (1952) correctly noted that these specimens are stragglers from some member of Icteridae.

Present status: *Brüelia abrupta* (Osborn, 1896).

Nurmus cordatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 228, pl. II, Fig. a.

The Museum of Comparative Zoology has slide number 27336(329), with one female and one nymph, as recorded by Osborn. Edwards (1952) has discussed and illustrated this material. The female is designated Lectotype.

Present status: *Rotundiceps cordatus* (Osborn, 1896).

Nirmus marginatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 228, pl. II, Fig. b. (not Burmeister, 1838).

Degeeriella marginatulus Harrison. 1916. Parasitology, 9: 117. (Nomen novum).

Osborn did not record the number of specimens in the type series. A female was illustrated. The Museum of Comparative Zoology has slide number 27339(326) with three females. The female located on the right side of the slide is designated Lectotype.

Present status: *Picicola marginatulus* (Harrison, 1916).

Nirmus ornatissimus var. *xanthocephali* Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 224.

The type material for this species could not be located. Hopkins and Clay (1952) consider the present status of this species to be *Brüelia xanthocephali* (Osborn, 1896).

Nirmus orpheus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 227.

Osborn recorded two males which are on the Museum of Comparative Zoology slide number 27340(312). The host listed on the slide is "*Orpheus carolinensis*." The male located on the top portion of the slide is designated Lectotype.

Present status: *Picicola orpheus* (Osborn, 1896).

Nirmus pallidus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 227. (not Piaget, 1880).

Degeeriella pallidula Harrison. 1916. Parasitology, 9: 120. (Nomen novum).

Ohio State University has a slide with four nymphs which were recorded by Osborn. These specimens are too young for specific determination beyond the fact that they belong to the genus *Brüelia*.

Present status: *Brüelia pallidula* (Harrison, 1916).

Nirmus parallelus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 229, pl. II, Fig. d.

Osborn did not record the number of specimens in the type series. A male was illustrated. The Museum of Comparative Zoology has slide number 27336(323) with three females; slide number 317 with one male and three females; and slide number 318 with three females. The male on slide number 317 is designated Lectotype.

Present status: A synonym of *Quadriceps hiaticulae boophilus* (Kellogg, 1896).

Nirmus picturatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 226.

The type material for this species could not be located. Hopkins and Clay (1952) consider the present status of this species to be *Brüelia picturata* (Osborn, 1896).

Nirmus rotundatus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 226.

Osborn recorded only one specimen, which could not be located.

Ansari (1957) considers the present status of this species to be *Brüelia rotundata* (Osborn, 1896).

Nirmus secundarius Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 227.

The type material for this species could not be located. Clay (1958) stated "It is not possible to assign this species with certainty to the *Degeeriella*; if the types are no longer in existence the name should be discarded as a nomen dubium."

Nirmus tyrannus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 228.

Osborn recorded two females in the type series. The Museum of Comparative Zoology has slide number 27341(313) with two females. The female on the top portion of the slide is designated Lectotype. These specimens are stragglers from *Chordeiles minor* (Forster) and are conspecific with material from that host.

Present status: A synonym of *Mulcticola macrocephalus* (Kellogg, 1896).

Physostomum hastatum Osborn. 1896. Ohio Naturalist, 2: 203, pl. 14, Fig. 3.

Osborn recorded two females from *Junco hyemalis oregonus* which could not be located. He also recorded one female from *Junco aieni*, which is on a slide at Ohio State University; and which is herewith designated Lectotype.

Present status: *Ricinus hastatus* (Osborn, 1902).

Physostomum lineatum Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 248.

Osborn recorded three specimens, none of which could be located. Hopkins and Clay (1952) consider the present status of this species to be *Ricinus lineatus* (Osborn, 1896).

Trichodectes castoris Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 241, Figs. 149a-d.

Osborn did not record the number of specimens in the type series. Both sexes were illustrated. The University of Nebraska has five females, three males, and two nymphs. The United States National Museum has seven females and seven males. Ohio State University has three males, two females and three nymphs; the male located on the left center portion of this slide is designated Lectotype. All slides bear the additional data "Lincoln, Nebr., Nov. 17, 1890." These specimens are stragglers from *Mephitis mephitis hudsonica* Richardson and are conspecific with material from that host.

Present status: A synonym of *Neotrichodectes mephitidis* (Packard, 1873).

Trichodectes geomydis Osborn. 1896. Bull. U. S. Bur. Ent., 7: 54, Fig. 42.

Osborn did not record the number of specimens in the type series. A

male was illustrated. Ohio State University has one slide with four females and two males. The male in the lower right position on the slide is designated Lectotype.

Present status: *Geomydoecus geomydis* (Osborn, 1896).

Trichodectes mephitidis Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 242, Figs. 150a-f. (not Packard, 1870).

Neotrichodectes osborni Keler. 1944. Stettin. ent. Ztg., 105: 182. (Nomen novum).

Osborn recorded type material from three collections. The series from "Polecat, Spilogale interrupta, Tama County, Iowa" was described and illustrated. Since this form is not conspecific with *T. mephitidis* Packard, 1870, Keler (1944) published *Neotrichodectes osborni* as a nomen novum; thereby restricting the name to the form found on this host. The series has not been located, so the designation of a Lectotype cannot be accomplished at this time.

Osborn also recorded type material from "Mephitis mephitica, Holt Co., Nebraska," which has been located as follows: University of Nebraska—nine females, two males, and thirty-two nymphs; and Ohio State University—one male, one female, and six nymphs. He also recorded specimens from *Mephitis mephitica* from "Palo Alto, California, Johnson Collection." Iowa State University has six males, sixteen females and one nymph with collection data "Meph. meph., Palo Alto, Calif., June 26, 1893, W. G. J." which are probably this series. All specimens from "Mephitis mephitica" are conspecific with *Neotrichodectes mephitidis* (Packard, 1870).

Trichodectes nasuatis Osborn. 1896. Ohio Naturalist, 2: 178, pl. II, Fig. 3.

Osborn recorded three females and one nymph, which are on a slide at Ohio State University. The female located on the upper left portion of the slide is designated Lectotype.

Present status: A synonym of *Neotrichodectes pallidus* (Piaget, 1880).

Trichodectes parallelus Osborn. 1896. Bull. U. S. Bur. Ent. (n.s.), 5: 240, Fig. 148.

Osborn recorded three females received from J. H. Comstock of Cornell University. Ohio State University has a slide with three teneral females. The collection data on the slide are "Deer, Ithaca, N. Y., 12 Aug. 86, L. Pearson, Coll., From Cornell Univ." The uppermost specimen, also in the center, is designated Lectotype. The types of *Trichodectes odoecoilei* McGregor have been examined, and are conspecific with these specimens. The specimens that Peters (1930) referred to as *T. parallelus* Osborn are probably those that Osborn identified and illustrated as *Trichodectes tibialis* (Bull. U. S. Bur. Ent. (n.s.), 5: 240, Fig. 147) since that series contained both males and females.

Present status: *Tricholipeurus parallelus* (Osborn, 1896).

Trichodectes thoracicus Osborn. 1902. *Ohio Naturalist*, 2: 178, pl. II, Fig. 4.

Osborn did not record the number of type specimens. A female was illustrated. Ohio State University has one slide with two males, three females, and two nymphs. The female located in the top center portion of the slide is designated Lectotype; the collection data are "Mar. 3, Lake Co., Calif. W. G. Johnson." Iowa State University has eight males, fifteen females and seven nymphs on three slides with collection data "Bassar, Ringtail or Raccoon Fox, Lake Port, Lake Co., Calif., 4 Mch 93, W. G. Johnson."

Present status: *Neotrichodectes thoracicus* (Osborn, 1902).

Trinoton minor Osborn. 1896. *Bull. U. S. Bur. Ent. (n.s.)*, 5: 248.

Osborn recorded a female on slide number 102, which is in the Museum of Comparative Zoology. The specimen is a nymph, and not a female. It is in such poor condition that a satisfactory comparison could not be made with specimens from *Oidema nigra*, the type host.

Present status: *Trinoton minor* Osborn, 1896.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW LONG-TAILED VOLE
(*MICROTUS LONGICAUDUS* (MERRIAM))
FROM UTAH

BY M. RAYMOND LEE AND STEPHEN D. DURRANT

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The Henry Mountains located in Wayne and Garfield counties of south-central Utah, constitute a small range having 5 major peaks of which only 3 exceed 10,000 feet in elevation. The entire range is surrounded on all sides by low-lying desert. Thus, these mountains are effectively isolated from neighboring highlands and at their higher elevations form a montane island in a desert. Because of the inaccessibility of these mountains, few mammals had been obtained previously from there. When Durrant prepared his "Mammals of Utah, Taxonomy and Distribution" (Univ. Kansas Publs. Mus. Nat. Hist., 6: 371-375, 10 August 1952), he knew of no specimens of *Microtus longicaudus* from the Henry Mountains. During the past four years, we have collected these mountains intensively and have disclosed the occurrence there of the long-tailed vole. A study of these mice reveals that they merit sub-specific recognition.

All measurements are in millimeters. Capitalized color terms are after Ridgway (Color Standards and Color Nomenclature, Washington, D. C., 1912).

For the loan of comparative materials, we extend appreciation to Seth B. Benson, Museum of Vertebrate Zoology, University of California, Berkeley, California; E. Raymond Hall, Museum of Natural History, University of Kansas; Viola S. Schantz, U. S. Fish and Wildlife Service, U. S. National Museum, Washington, D. C.

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***Microtus longicaudus incanus*, new subspecies**

Type: Adult male, skin and skull, number 14,286, Museum of Zoology, University of Utah; ¼ mile southeast of Burned Ridge, Mount Ellen, Henry Mountains, 10,300 feet, Garfield County, Utah; 10 September 1957, collected by M. Raymond Lee, original number 1512.

Range: Henry Mountains of Wayne and Garfield counties, Utah.

Diagnosis: Size: Small (see statistics); caudal index (ratio of length of tail to length of head and body) small (see statistics). Color: Light, dorsum and top of head near Light Ochraceous-Buff with slight admixture of dark hairs; sides, face and feet gray (gray of sides extends well onto back in majority of specimens); hairs of venter white-tipped, plumbeous basally. Skull: Small (see statistics); relatively smooth at all ages; nasals short and wide distally; interparietal long (anteroposteriorly) and nearly rectangular in shape; maxillary plate of orbit wide with straight or convex anterior margin; anterior opening of infraorbital foramen narrow.

Statistics: Analyses of the external and cranial characters of the type and adult topotypes and near topotypes from Burned Ridge, Eagle and Sawmill basin are:

CHARACTER	SEX	n	$\bar{x}$	$\pm$ S.E.	S.D.	R
Total length	F	12	170.4	$\pm$ 2.68	9.30	186-155
	M	5	172.6	$\pm$ 3.74	8.38	182-162
Length of tail	F	12	53.1	$\pm$.90	3.12	58-49
	M	5	52.8	$\pm$ 1.91	4.28	59-49
Length of hind foot	F	12	21.1	$\pm$.36	1.24	24-19
	M	5	21.4	$\pm$.31	.70	22-21
Length of ear	F	12	14.3	$\pm$.25	.87	15-13
	M	5	14.0	$\pm$.32	.71	15-13
Caudal index	F	12	.454	$\pm$.011	.039	.542-.398
	M	5	.441	$\pm$.015	.033	.480-.389
Condylbasilar length	F	9	24.93	$\pm$.25	.76	26.1-24.0
	M	3	25.5	$\pm$.56	.97	26.1-24.4
Palatilar length	F	12	13.54	$\pm$.15	.53	14.5-13.0
	M	5	13.62	$\pm$.31	.70	14.7-13.0
Length upper molar series	F	12	6.58	$\pm$.06	.21	6.8-6.3
	M	5	6.52	$\pm$.13	.30	7.1-6.3
Zygomatic breadth	F	11	14.92	$\pm$.2	.65	16.4-14.2
	M	5	15.06	$\pm$.31	.70	15.7-13.9
Width of bulla	F	9	5.84	$\pm$.06	.24	6.1-5.4
	M	3	6.2	$\pm$.11	.20	6.4-6.0

n = sample size
 $\bar{x} \pm$ = mean and standard error

S.D. = standard deviation
 R = extremes

In the majority of characters listed, the difference between males and females is insignificant.

Comparisons: Members of the subspecies *Microtus longicaudus incanus* are the grayest of any population within the species that has been studied. Specimens of *M. l. incanus* can be distinguished from topotypes of *M. l. latus* and *M. l. mordax* as follows: Size: Smaller; caudal index decidedly less (.450 as compared to .505 and .516). Color: Grayer. Skull: Less angular in adults, smaller; distal ends of nasals wider and more inflated; maxillary plate of orbit wider and with anterior border straight or convex as opposed to concave; tympanic bullae narrower and longer; anterior opening of infraorbital canal narrower; interparietal longer (anteroposteriorly) and more rectangular as opposed to pentagonal; foramen magnum smaller.

Compared with topotypes of *M. l. alticola* specimens of *M. l. incanus* show the following: Size: Larger; caudal index about equal. Color: Markedly grayer. Skull: Larger; distal ends of nasals wider; rostrum relatively shorter; tympanic bullae longer and more inflated; interparietal larger and more rectangular; interpterygoid space narrower; foramen magnum larger.

Remarks: Morphological studies reveal that *M. l. incanus* was derived from the same ancestral stock from which the *M. l. mordax*-*M. l. latus* group arose. Although distinctive, specimens of *M. l. incanus* are most closely allied to the long-tailed voles which inhabit the Aquarius Plateau to the west of the Henry Mountains. The Henry Mountains are separated from the Aquarius Plateau by approximately 20 miles of desert which, at its lowest point, extends downward to an elevation of approximately 5,800 feet. These voles were not found below 8,000 feet on either the Henry Mountains or the Aquarius Plateau and thus it is evident that these mammals are totally isolated on the Henry Mountains. Moreover, the extent and degree of their isolation is reflected in the considerable amount of differentiation which they have undergone.

The factors responsible for this isolation are not completely understood although it is generally known, that at this latitude, these voles require a montane type of vegetation in addition to rather mesic conditions. On the basis of the knowledge relative to past climatic conditions, we are able now to give an estimate of the minimal time of isolation of *Microtus longicaudus* on the Henry Mountains. Also, this knowledge enables us to explain how these voles became isolated on these mountains. Because of the colder climate during the Valdres glacial substage of the Wisconsin glacial period, the montane vegetation was known to have been depressed 2,500 feet in elevation. This is sufficient to bridge the now existing desert area between the Henry Mountains and the Aquarius Plateau. This occurred 10,000 to 11,000 years ago, and the voles would have had ready access during this time to both areas.

Antevs (American Antiquity, 20 (4): 326) has shown that since the Cary Maximum, climatic conditions in the Great Basin and contiguous areas have become in general progressively warmer and drier. During

the Anathermal approximately 8,500 years ago, the climate was similar to that of today. Approximately 4,000 to 7,500 years ago, or during the Altithermal, a maximum of aridity and warmth was attained which accentuated the desert conditions between the Henry Mountains and the western plateaus, and effectively destroyed the bridge of montane vegetation which previously had enabled these mammals to cross back and forth between these two areas. The climate during the Medithermal or that period succeeding the Altithermal, although fluctuating somewhat, was less arid than the latter. According to Antevs (*loc. cit.*), it appears unlikely, however, that the fluctuations toward cooler and more moist conditions during the Medithermal were of sufficient magnitude to re-establish a suitable habitat for these voles to enable them to bridge the area between the Henry Mountains and the plateaus to the west. In addition, there is little doubt but that these voles were even more effectively isolated during the Altithermal when the climate was considerably more arid than at present. From the foregoing, it seems justifiable to consider that during the past 8,500 to 9,000 years no gene exchange has occurred between the populations of *Microtus longicaudus* on the Henry Mountains and those on the plateaus to the west.

Specimens examined: Total, 26, distributed as follows: Garfield County: S end Sawmill Basin, Henry Mtns., 9,500 ft, 1; Sawmill Basin, 9,100 ft, 1; Burned Ridge, Mt. Ellen, 10,300 ft, 10; $\frac{1}{4}$ mi SE Burned Ridge, Mt. Ellen, 10,300 ft, 6; Eagle, E slope Mt. Ellen, 7,800 ft, 5; Straight Creek, E slope Mt. Pennell, 9,000 ft, 3.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

A NEW JUMPING MOUSE (*ZAPUS PRINCEPS* ALLEN)
FROM UTAH

BY M. RAYMOND LEE AND STEPHEN D. DURRANT

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Salt Lake City, Utah*

When Durrant wrote the Mammals of Utah, Taxonomy and Distribution (Univ. Kansas Publs. Mus. Nat. Hist., 6: 385-388, 10 August 1952), jumping mice were unknown from the La Sal Mountains of eastern Utah. Kruttsch also lacked specimens from here when he reviewed the North American Jumping Mice (Univ. Kansas Publs. Mus. Nat. Hist., 7: 375, 21 April 1954). During a collecting trip to these mountains in August, 1955, we trapped two of these mammals and since that time, despite intensive efforts, only three additional specimens have been obtained. Analysis of these five specimens reveals that they represent an undescribed subspecies which herein is given nominal recognition.

Grateful acknowledgments are extended to Seth B. Benson, Museum of Vertebrate Zoology, University of California, Berkeley, California, for the loan of comparative materials and to Guy G. Musser, University of Utah, Salt Lake City, Utah, for his special efforts in collecting specimens of this new subspecies.

All measurements are in millimeters and capitalized color terms are after Ridgway (Color Standards and Color Nomenclature, Washington, D. C., 1912). Financial assistance for this study was provided by the National Science Foundation under grants NSF-G339 and NSF-G1412.

***Zapus princeps chrysogenys*, new subspecies**

Type: Adult male, skin and skull, number 13,834, University of Utah, Museum of Zoology; 2½ miles northeast of La Sal Peak, La Sal Moun-

tains, 8,500 feet, Grand County, Utah; 17 July 1956; collected by M. Raymond Lee; original number 1,436.

Range: La Sal Mountains of Grand and San Juan counties, Utah.

Diagnosis: Size: Small (see measurements). Color: Mid-dorsal dark stripe markedly reduced being indistinct in 3 of 5 specimens; dorsum and sides Pale Yellow-Orange to Pale Ochraceous-Buff with considerable admixture of black hairs; lateral line Capucine Buff; venter white, lightly washed with Pale Yellow-Orange to Pale Ochraceous-Buff; cheeks Pale Yellow-Orange to Capucine Buff without admixture of black hairs; tail bicolored, whitish below and grayish above; hind feet grayish-white to yellowish-white above; ears distinctly edged with yellowish-white. Skull: Small (see measurements); superior ramus of zygoma wide and robust; maxillary tooth-row long relative to length of skull; tympanic bullae small with medial ends directed anteromedially; antorbital foramen small; nasals wide; presphenoid wide; projection present on inferior ramus of zygoma.

Measurements: Average and extreme measurements of the type and 4 topotypes (3 ♂♂, 1 ♀), collectively, are as follows: Total length, 215.2 (232–203); length of tail, 131.2 (139–117); length of hind foot, 31 (32–30); greatest length of skull, 23.5 (24.8–23.0); length of nasals, 9.4 (10.2–9.1); length of incisive foramina, 4.6 (5.1–4.2); width across M1, 5.16 (5.4–4.9); length of maxillary tooth-row, 4.08 (4.15–4.0).

Comparisons: Topotypes of *Zapus princeps chrysogenys* differ from those of *Z. p. princeps* as follows: Size: Smaller; tail relatively longer. Color: Paler, mid-dorsal dark stripe not as distinct; cheeks with less admixture of black hairs; lateral line Capucine Buff as opposed to Light Ochraceous-Buff or Cinnamon-Buff; margins of ears lighter. Skull: Smaller in most measurements; superior ramus of zygoma wider and more robust; tympanic bullae smaller; incisive foramina more ellipsoid as opposed to nearly parallel-sided; presphenoid wider; maxillary tooth-row longer; antorbital foramen smaller.

Compared with specimens of *Z. p. luteus* from the West Fork of Black River, Apache County, Arizona, topotypes of *Z. p. chrysogenys* differ as follows: Size: Larger. Color: Markedly less Ochraceous; sides near Pale Yellow-Orange as opposed to near Cinnamon-Buff; tail grayish as opposed to brownish. Skull: Posterior ends of nasals wider; antorbital foramen markedly smaller; incisive foramina longer and wider posteriorly; tympanic bullae smaller; maxillary tooth-row longer; superior ramus of zygoma wider and heavier.

From near topotypes of *Z. p. utahensis*, topotypes of *Z. p. chrysogenys* differ as follows: Size: Smaller. Color: Lighter; mid-dorsal dark stripe less blackish and markedly less distinct; venter lightly washed with pale buff as opposed to pure white; distinct light cheek patch present as opposed to none. Skull: Markedly smaller; zygomata parallel rather than bowed laterally; inferior and superior rami of zygoma actually as well as relatively more robust; upper tooth-rows diverging less anteriorly;

palatal bridge longer relative to length of skull; presphenoid wider; tympanic bullae less inflated ventrally.

Remarks: The La Sal Mountains are completely isolated and are surrounded by desert. In Utah, jumping mice are restricted to mountains at the higher elevations; hence, this population is completely isolated because of the lack of montane habitat between the La Sal and the neighboring mountains. Comparisons clearly indicate that the affinities of *Z. p. chrysogenys* are with the *Z. p. princeps*–*Z. p. luteus* complex of jumping mice and not, as would be expected with *Z. p. utahensis*, the closest subspecies geographically. In order to evaluate more precisely the relationship of *Z. p. chrysogenys* with the *Z. p. princeps*–*Z. p. luteus* complex the following observations are presented. Although paler and more yellowish, specimens of *Z. p. chrysogenys* most nearly resemble those of *Z. p. princeps*. In external measurements, they are intermediate between those of *Z. p. princeps* and *Z. p. luteus*. Specimens of *Z. p. chrysogenys* are reminiscent of those of *Z. p. princeps* in the shape of the nasals and incisive foramina and approach those of *Z. p. luteus* in generally smaller cranial dimensions. All characters considered, the affinities of *Z. p. chrysogenys* are closer to *Z. p. princeps* than to *Z. p. luteus*.

The fact that *Z. p. chrysogenys* shows some characteristics of both *Z. p. princeps* and *Z. p. luteus* suggests that the initial population of the La Sal Mountains was derived from an ancestral population which also possessed these characters. That the ancestral population had these characters might be explained in two possible ways: either it consisted of animals having characters like intergrades between *Z. p. princeps* and *Z. p. luteus*, or it was characterized by animals ancestral to all three of these subspecies and had some characters of each kind.

Among these three subspecies, *Z. p. luteus* is the most widely divergent, and it is suggested that this divergence required a longer period of time than was required for the divergence between *Z. p. princeps* and *Z. p. chrysogenys*. In other words, differentiation of *Z. p. luteus* from *Z. p. princeps*–*Z. p. chrysogenys* had progressed to a considerable degree before the differentiation between *Z. p. princeps* and *Z. p. chrysogenys* was initiated. It is assumed that the time of isolation is approximately proportional to the degree of morphological differentiation. If this were true, then it suggests that *Z. p. chrysogenys* was derived from a population of *Z. p. princeps* in which some characters of *Z. p. luteus* were still present, that is, an intergrading population which has subsequently undergone divergence.

Krutzsch (op. cit.: 415) reported one specimen from Florida, Colorado, that was intermediate between *Z. p. princeps* and *Z. p. luteus* and that similar intergrades are known from localities in northern New Mexico. Florida, Colorado, is south of the Rico and San Juan mountains. Hence, the nearest affinities of the members of the species *Zapus princeps* on the La Sal Mountains, like those of the red squirrel (*Tamiasciurus hudsonicus* (Erxleben)) and the pika (*Ochotona princeps* (Rich-

ardson)) from the same region, appear to be with animals occurring on mountains to the southeastward in Colorado.

Specimens examined: Total, 5, distributed as follows: Grand County: 2½ mi NE La Sal Peak, La Sal Mtns., 8,500 ft, 1; Beaver Creek, 2 mi NE Mt. Waas, La Sal Mtns., 8,720 ft, 2; Beaver Creek, 1½ mi E La Sal Peak, La Sal Mtns., 9,000 ft, 2.

PROCEEDINGS
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THE ELLISELLIDAE (OCTOCORALLIA) AND THEIR
BEARING ON THE ZOOGEOGRAPHY OF THE
EASTERN PACIFIC

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The complete absence of the gorgonacean family Gorgonellidae (properly Ellisellidae) from the eastern Pacific has been cited as an example of distribution illustrating the view that the shelf fauna of the American Pacific coast is not as closely related to the western Pacific fauna as is that of the Caribbean (Ekman 1935: 66; 1953: 40). However, this idea of the distributional pattern of the Ellisellidae is the result of incomplete knowledge of the composition of the west American fauna, and seems to derive largely from the works of Kükenthal, notably his monograph of the Gorgonaria in the reports of the German Deep Sea Expedition (1919: 856-862). Material now in our hands, preserved in the collections of the U. S. National Museum and the Museum of Comparative Zoölogy, shows conclusively that members of the Ellisellidae do indeed occur along the Pacific coast of the Americas, a graphic demonstration that thorough faunal sampling is an indispensable foundation for zoogeographic speculation. In this case, increased knowledge of distribution does not alter the basic zoogeographic conclusion; it merely requires the selection of some new examples from a relatively unaltered body of evidence. Moreover, the two examples of gorgonacean genera cited by Ekman as occurring in the eastern Pacific as well as in its western parts, contrary to his theory—*Psammogorgia* and *Heterogorgia*—do not, in fact, have any such distribution. This erroneous notion resulted from a misunderstanding of the two genera, as well as from misidentifications made by Nutting

(1910a, 1910b) and mostly accepted by Kükenthal (1919, 1924). So far as we know at this writing, neither *Psammogorgia* nor *Heterogorgia* occurs anywhere outside of the Panamic province, a further demonstration that zoogeography is no better than the systematics upon which it is based.

FAMILY ELLISELLIDAE

This exceptionally well-defined family is characterized by a remarkably uniform type of spicule and a strongly calcified axial cylinder with its calcareous fibers oriented radially and without a soft, cross-chambered medulla. Its genera and species, on the other hand, are with few exceptions especially difficult to separate. The genera *Ctenocella* (Indo-west-Pacific) and *Riisea* (Caribbean) are unmistakably recognized by their peculiar modes of branching, and *Junceella* (Indo-west-Pacific) by its spicules, but the rest—*Ellisella*, *Toeplitzella*, *Verrucella* and *Nicella*—are not always so easy to recognize. The genera as now accepted may be differentiated according to the following key:

- I. Colonies whiplike, flagelliform or, if branched, with only a few long, slender, and comparatively straight branches
 - A. Colonies branched in one plane, with several long, straight terminal branches arising in a lyrate or bipectinate manner . . . *Ctenocella* Valenciennes
 - B. Colonies simple or, if branched, not lyrate
 1. Cortical spicules include many symmetrical clubs . . . *Junceella* Valenciennes
 2. Cortical spicules are always dumb-bells, never clubs
 - a. The calicles contain spindles that are longer than the dumb-bells of the cortex . . . *Ellisella* Gray
 - b. The calicles contain only dumb-bells like those of the cortex . . . *Toeplitzella* Deichmann
- II. Colonies abundantly branched, the terminal branchlets rather short and usually quite crooked, sometimes anastomosing
 - A. Branching openly pinnate, terminal branchlets short, bearing only 1–4 polyps of which one is apical, bent like the bowl of a clay pipe; the diameter of the polyps is greater than that of the branchlets. Core of axis strongly eccentric . . . *Riisea* Duchassaing and Michelotti
 - B. Branching lateral or asymmetrically dichotomous, the terminal branchlets developing many polyps; calicles hemispherical, not tubular, equal to the terminal branches in diameter or smaller. Core of axis about central
 1. The calicles contain numerous spindles that are conspicuously longer than the dumb-bells . . . *Nicella* Gray
 2. The calicles contain only spicules like those of the rind, no long spindles . . . *Verrucella* Milne Edwards and Haime

The material now before us contains three records of the genus *Ellisella* from Baja California. One of these was collected by Heinz A. Lowenstam of the California Institute of Technology, and another by the late Conrad Limbaugh of Scripps Institution of Oceanography, to both of whom we are most grateful. The third was collected by the steamer "Albatross" many years ago. The collections of the U. S. National Museum also contain specimens of a *Nicella* labeled "Gulf of California," possibly in error, which are mentioned so that investigators now active along the Pacific coast may be on the alert for new records to confirm this doubtful find.

Genus *Ellisella* Gray

Ellisella Gray 1858, Proc. Zool. Soc. London 1857 (vol. 25): 287. (Type species, *Gorgonia elongata* Pallas, by subsequent designation: Nutting 1910: 31.)

Diagnosis: Simple or sparingly branched colonies with long terminal branches not arising in a regular lyrate plan. Cortical spiculation consisting of short double heads and somewhat longer double rods or spinules, the latter most heavily concentrated in the calicular part of the polyps. Pharyngeal walls containing slender rods with usually two belts of angular warts.

The discrimination of species in this genus is a vexing matter. The characters usually employed are: (1) form of colony, including manner and extent of branching; (2) arrangement and size of calicles; (3) shape and relative size of the calicular rods in comparison with the spicules of the general cortex; and (4) the type of double-head spicules predominating in the cortex, i.e., the double sphere or "dumb-bell" type, which has two uniformly warted spheroidal heads connected by a constricted neck; or the "capstan" type, which has two whorls or transverse girdles of rather irregular tubercles, and terminal clusters, separated by a rather wide neck. These characters are without exception difficult both to evaluate and to express in words and keys and, to complicate matters, are also subject to variation.

The specimens before us share so many characters that we are convinced we are dealing with a single species. Although we are unable at the present time to reconcile it with any species of *Ellisella* heretofore described, a thorough revision of the genus may show it to be identical with one of the Indo-west-Pacific species already known.

***Ellisella limbaughi*, new species**

(Figs. 1-2)

Material examined: (Holotype) Baja California: southwest of Holcombe Point at entrance of San Ignacio Lagoon, Pacific coast. Depth, 28 fathoms. Heinz Lowenstam, May 1950. (Mus. Comp. Zool. cat. no. 3939.)

(Paratype) Baja California: south of Cape San Lázaro, Pacific coast, 24° 38' 00" N, 112° 17' 30" W. Depth, 51 fathoms. U. S. Fish Com-

mission steamer "Albatross" station 2833, 2 May 1888. (One specimen in alcohol, U.S.N.M. cat. no. 51577.)

(Additional specimen) Baja California: Cape San Lucas Canyon. Depth, 100–200 feet; taken by diving. Conrad Limbaugh and J. Stewart, March 1959. (One specimen dry, U.S.N.M. cat. no. 51576.)

Diagnosis: Colonies sparingly branched, with long, slender terminal branches. Polyps in two lateral bands, set in strongly oblique rows of 3–6, except near the branch tips where there may be only 2 (i.e., in alternating double rows). Calicular rods rather blunt, 0.08–0.1 mm long, not much larger than the double heads, which measure at most 0.06–0.08 mm; double heads including many of the capstan type as well as double spheres. Color, dull orange; calicles and rind identically colored.

Descriptive remarks: The three colonies are similar in their rather small size and sparse branching. The polyps are separated by two naked bands into two lateral tracts in which they are arranged diagonally in rows of 3–5, except near the base where there may be 6 polyps in the diagonal rows, and near the branch tips where there may be as few as two. In the two colonies in which the base is preserved, there are no polyps on the proximal part of the main trunk. The calicles are preserved differently in each of the three specimens. In U.S.N.M. no. 51577, preserved in alcohol, they are up-turned but prominent and the tentacles are extended (Fig. 1 a). In one of the dry specimens (the holotype), M.C.Z. no. 3939, they are appressed upward in a scale-like manner (Fig. 1 c), as if the colony had been stimulated to the fullest degree of contraction before it was dried, whereas in the third specimen, U.S.N.M. no. 51576, they are in an intermediate condition (Fig. 1 b). In this genus, the prominence of the calicles in preserved specimens is not a reliable character because it depends so much upon the methods of preservation used, the condition of the colony, and the reaction of individual polyps, as occasionally can be seen even in a single colony.

The holotype, M.C.Z. no. 3939, is a once forked branch 28 cm in length, lacking both main trunk and branch tips. At the lowest part it has a diameter of 2.5 mm, in the uppermost part 1.5 mm. The contracted calicles, which are depressed into pits in the cortical surface, are oval, scale-like, somewhat bilobed above, and measure roughly 0.5–0.7 mm across. The calicular rods (Fig. 1 e) are conspicuously constricted at the waist, tapered, but not acute. They are at most about 0.08 mm long and thus not much longer than the largest double heads, which measure 0.06 mm. The double heads include capstans with conspicuous terminal clusters, and smaller dumb-bells in which the warts show little or no tendency to separate into transverse girdles and terminal tufts (Fig. 1 f). The axial sheath contains capstans up to 0.06 mm in length, not so strongly sculptured as those of the outer rind (Fig. 2 a). The pharyngeal walls contain slender rods with two transverse belts of tubercles (Fig. 1 d, left), about as long as the calicular rods but much slimmer. The tentacles contain irregularly sculptured rods (Fig. 1 d, right two) that grade quickly into the typical spicules of the calicular walls proximad. The

spicules are pale amber yellow except those of the axial sheath, tentacles, and pharynx, and some of the calicular rods, which are nearly or quite colorless.

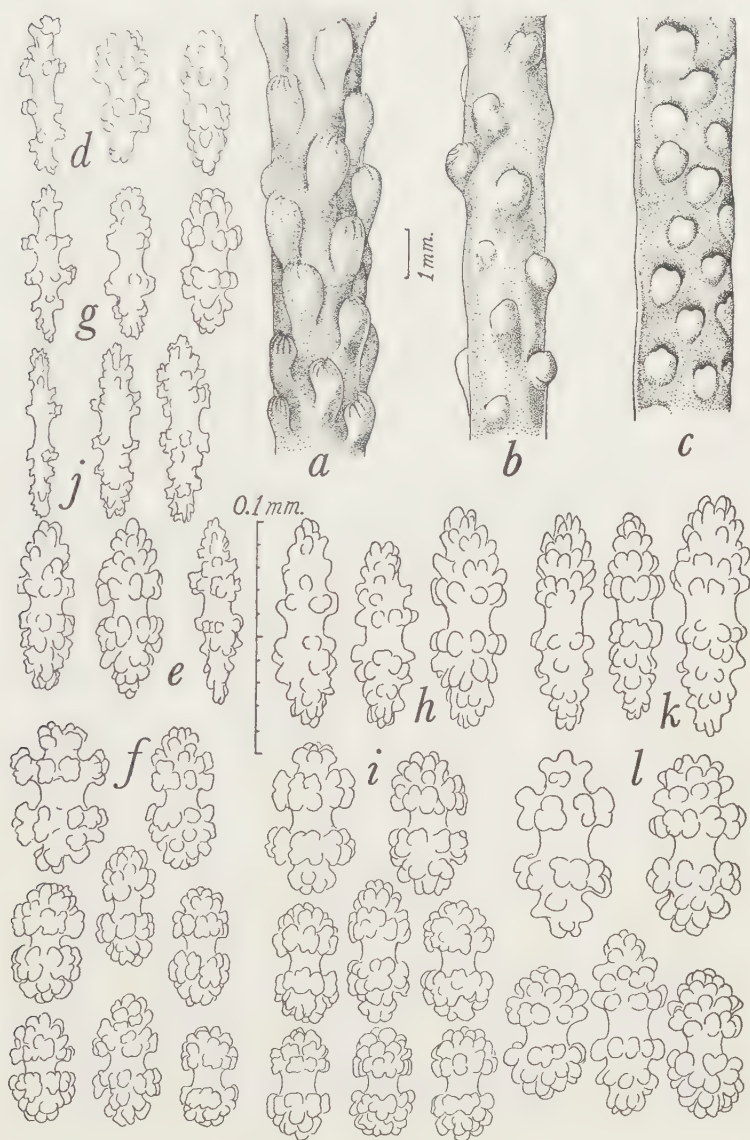


FIG. 1

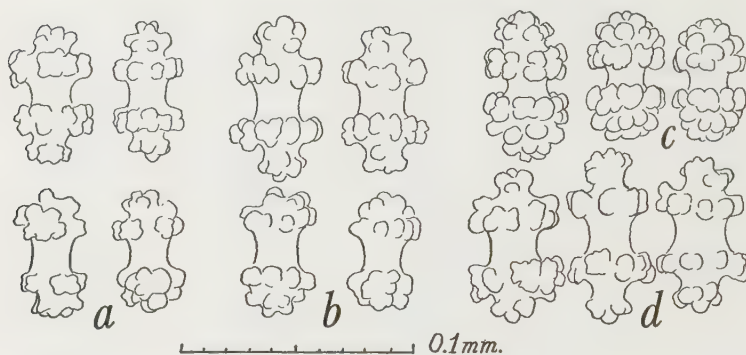


FIG. 2

The paratype, U.S.N.M. no. 51577, is a forked colony 18 cm tall, with its basal disk but lacking the uppermost parts, which are eroded away. Just above the base, the main stem has a diameter of 3 mm; the uppermost branch measures 2.5 mm in diameter. The main branch was terminally eroded during the life of the colony, and the lower branch and its secondary branch are entirely decorticated. The calicles are upturned, not much contracted, somewhat more than 1 mm tall with tentacles extended; they are arranged in oblique rows of 3–5, which form two lateral bands as in the holotype. The spicules are very similar in form to those of the holotype, but are slightly larger. The calicular rods (Fig. 1 h) reach a length of 0.1 mm and the double heads (Fig. 1 i) 0.065 mm. The pharyngeal and tentacular rods (Fig. 1 g), and the capstans of the axial sheath (Fig. 2 b) are practically identical with those of the holotype.

A third specimen, U.S.N.M. no. 51576, is similar to the types in most respects. It is a slender, weakly branched colony with long, ascending terminal branches. Complete with base and all but a small tip of the uppermost branch, it has a height of 38.5 cm. The main stem forks three times unilaterally in rapid succession to produce four closely placed terminals. The main trunk measures 2.5 mm in diameter; in the middle of the colony the diameter is about 2 mm, tapering to 1 mm near the branch tips. The polyps are low, upturned and somewhat clavate, not so fully contracted as in the holotype. They are placed on the branches in lateral bands composed of 2–5 individuals in oblique rows (Fig. 1 b). The spicules are practically identical in form with those of the types but are consistently larger. The longest calicular rods measure slightly more than 0.1 mm (Fig. 1 k). The largest double heads measure 0.08 mm and the smaller dumb-bells are commonly 0.06 mm in length (Fig. 1 l, 2 c). The capstans of the axial sheath (Fig. 2 d) may be 0.07 mm in length, a few slightly larger.

Ellisella limbaughi clearly belongs to the *elongata* group of species as

indicated by its colonial form and by the relatively small size of its calicular rods. However, its colonies are much more delicate than those of either *E. elongata* (Pallas) or *E. grandis* (Verrill), both of which are huge species, and its spicules include many dumb-bells in which there is no differentiation of terminal clusters of tubercles. *Ellisella limbaughi* most closely approaches certain of the colonies included by Simpson (1910: 339) under *Scirpearia furcata* from the Indian Ocean, a species that was removed to *Ellisella* (= *Toeplitzella* Deichmann) by Toeplitz because it seems to lack the special calicular rods of *Scirpearia*. It may eventually prove that *E. limbaughi* is identical with one of them, but this would give it an exceptionally wide distribution for a shallow-water gorgonian.

This species is named in memory of Conrad Limbaugh, who recently lost his life in a diving accident.

Genus *Nicella* Gray

Nicella Gray 1870, Cat. Lithophytes Brit. Mus.: 40. (Type species, *Nicella mauritiana* Gray 1870 = *Scirpearia dichotoma* Gray 1859, by monotypy.)

Nicella, Deichmann 1936, Mem. Mus. Comp. Zool. 53: 216.

Diagnosis: See Deichmann 1936: 216.

Nicella guadalupensis (Duchassaing and Michelotti)

Verrucella guadalupensis Duchassaing and Michelotti 1860, Mém. Corall. Antill.: 33, pl. 4, Figs. 5-6. (Guadeloupe.)

Nicella guadalupensis, Deichmann 1936, Mem. Mus. Comp. Zool. 53: 218, pl. 36. (Various localities from Dry Tortugas to Barbados.)

Material examined: Two large dried specimens (one of them broken into three pieces) labeled "Gulf of California," collected by W. J. Fisher and received from R. E. C. Stearns (U.S.N.M. cat. no. 8972). Although other gorgonians in the Fisher collection are typical Panamic species, some of the material received from Stearns came from diverse localities, suggesting that an error of labeling may have occurred.

Remarks: The two specimens from the "Gulf of California" differ conspicuously in spiculation but they both fall well within the remarkable range of variation observed in West Indian *Nicella guadalupensis*. One of the specimens has long, acute calicular rods, as in U.S.N.M. 7617 from Havana, Cuba; the other has short, blunt rods, as in U.S.N.M. 44134 from Barbados. Both colonies are dull yellow with nearly white calicles, a color pattern commonly found in *N. guadalupensis*.

GORGONIANS AND THE ZOOGEOGRAPHY OF THE AMERICAN PACIFIC COAST

Although the discovery of Ellisellidae on the coast of Baja California removes one important item of evidence from Ekman's contention that the eastern Pacific shelf-fauna is not so closely related to the western Pacific as is the Caribbean, this is offset by the fact that *Psammogorgia* and *Heterogorgia* are endemic to the west American shelf-fauna and do

not occur also in the western Pacific as Ekman had been led to believe by the literature. The gorgonians of both Atlantic and Pacific coasts of tropical America show a marked degree of endemism and are closely related, as is clearly indicated by the preponderance of gorgoniids and plexaurids. However, at somewhat greater depths—down to 100 fathoms—there are other gorgonians whose distribution supports the opinion of Ekman, among them the genera *Bebryce*, *Villogorgia*, *Placogorgia*, and *Eunicella*, which actually are not known to occur along the Pacific coast. All that can be said is that the Atlantic and Pacific American gorgonian faunas form a closely related unit with conspicuous amphi-American elements, and the Atlantic component bears somewhat closer ties with the Indo-west-Pacific fauna than does the Pacific component, as suggested by Ekman.

EXPLANATION OF FIGURES

Fig. 1. *Ellisella limbaughi* sp. nov.: a.—Part of branch of paratype, U.S.N.M. 51577. b.—Part of branch of U.S.N.M. 51576. c.—Part of branch of holotype, M.C.Z. 3939. d-f.—Spicules of holotype (d, rod from pharynx and two intermediate forms from tentacles; e, calicular rods; f, cortical capstans and double heads). g-i.—Spicules of paratype (g, rod from pharynx and two intermediate forms from tentacles; h, calicular rods; i, cortical capstans and double heads). j-l.—Spicules of U.S.N.M. 51576 (j, rod from pharynx and two intermediate forms from tentacles; k, calicular rods; l, cortical capstans and double heads).

Fig. 2. *Ellisella limbaughi* sp. nov.: a.—Capstans from inner layer, holotype. b.—Capstans from inner layer, paratype. c.—Outer cortical double heads, U.S.N.M. 51576. d.—Capstans from inner layer, U.S.N.M. 51576.

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THE DISCOVERY OF A FRESHWATER
OPISTHOBRANCHIATE MOLLUSK,
ACOCHLIDIUM AMBOINENSE STRUBELL,
IN THE PALAU ISLANDS

BY FREDERICK M. BAYER AND H. ADAIR FEHLMANN

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Two peculiar shell-less opisthobranchs obtained by A. Strubell in a stream in Amboina were briefly described by the collector and named *Acochlidium amboinense* and *A. paradoxum* (Strubell, 1892: 62). Prof. Max Weber collected some animals similar to the first of these in the mouth of a river in Flores, which were described by Bergh as *Hedyle weberi* (Bergh, 1895: 4). Strubell's deficient description of *Acochlidium amboinense* was supplemented by Bücking's study of the original specimens, making it clear that *A. amboinense* and *H. weberi* are distinct species of one genus (Bücking, 1933: 549-582).

The latter, properly called *Acochlidium weberi* (Bergh), has recently been reported from Sumba by van Benthem Jutting (1955: 55) but *A. amboinense* has not been seen again. Some animals very similar to it in general appearance were discovered by one of us (Fehlmann) during the course of a detailed ecological survey of a stream on the southwest coast of Babelthuap, the largest of the Palau Islands, in September of 1957. When these proved to be of unusual interest, additional specimens were collected during a subsequent visit in October, 1958, and color photographs were made of the living animals. We were then able to confirm the identification as *Acochlidium amboinense* Strubell.

It is not our purpose to give a history of these remarkable freshwater opisthobranchs, which already has been done by

Bücking (1933) and Odhner (1937, 1938), but to report the occurrence of the genus in a stream in the Palau Islands, nearly a thousand miles from the original locality in Amboina, and separated by 500 miles of the Pacific Ocean from other large islands where it reasonably might be expected.

We are indebted to Harold W. Harry, who undertook the preliminary dissections of the first lot of specimens obtained and who made tentative determination of their taxonomic position. We are grateful also to W. S. S. van Benthem Jutting van der Feen of the Zoological Society of Amsterdam, who called our attention to her paper on freshwater mollusks from Sumba and showed one of us (Bayer) the specimens of *Acochlidium weberi* reported therein, and to Harald A. Rehder of the Smithsonian Institution, who gave freely of his time to help us in the search for literature and to read the manuscript. The field work that provided our specimens was aided by contract NR 160 321 between the Office of Naval Research, Department of the Navy, and the National Academy of Sciences—National Research Council, under the auspices of the Pacific Science Board, and by contract AT (04-3)-102 between the United States Atomic Energy Commission and Stanford University. Logistic aid and permission to conduct field work in the Palau Islands were provided by the Trust Territory of The Pacific Islands, United States Department of the Interior. We are, as always, grateful for the encouragement and support of the George Vanderbilt Foundation of Stanford University, and of the Smithsonian Institution, Washington, D. C.

Genus *Acochlidium* Strubell

Acochlidium Strubell 1892, Verhandl. naturh. Ver. preuss. Rheinlande, 49. Jg., Sitzung der niederrheinischen Ges. 13. Juni 1892: 62.

Hedyle Bergh 1895, Verhandl. zool. bot. Ges. Wien 45: 4.

not *Hedyle* Guénée 1857; not *Hedyle* Malmgren 1865.

Acochlidium, Odhner 1937, Zool. Anz. 120: 52, 64.

Acochlidium, Odhner 1938, Basteria 3: 5–11 (passim).

Hedyle, the generic name applied to these naked snails by Bergh in 1895 is not only a junior subjective synonym of *Acochlidium* Strubell, but is also twice preoccupied. In view of the fact that Strubell did provide some morphological information about his animals, and since a name is not nude unless it is devoid of all descriptive matter, the names he pro-

posed are not nomina nuda. We must therefore disagree with Odhner in attributing authorship to Bücking.

The external morphology of the specimens from the Palau Islands is very close to that of *Acochlidium amboinense* as redescribed by Bücking, and gross dissections demonstrate that anatomical characters, notably the radula, the penial armature, and the calcareous spicules, are also in close agreement. The discrepancies are so small as to be of little consequence, particularly in view of the fact that they may well be the result of different artistic representation of the features in question.

Acochlidium amboinense Strubell

(Figs. 1 and 2)

Acochlidium amboinense Strubell 1892, Verhandl. naturh. Ver. preuss. Rheinlande, 49. Jg., Sitzung der niederrheinischen Ges. 13. Juni 1892: 62.

Hedyle amboinensis, Bücking 1933, Zool. Jahrb. Syst. 64: 552, Figs. 1-27; pl. 2.

Acochlidium amboinense, Odhner 1937, Zool. Anz. 120: 52, 64.

Acochlidium amboinense, Odhner 1938, Basteria 3: 5-11, passim.

Material examined: Three lots of specimens, all from the same locality in the Palau Islands: south fork of Arakitauch stream, Airai Municipality, Babelthuap Island; cascade zone 150-190 feet above sea level; collected by H. A. Fehlmann and Sumang Yachad, 12 September 1957 (5 specimens), 16 September 1957 (4 specimens), and 2 October 1958 (10 specimens).

Descriptive remarks: The living animals measure about 2.5 cm in length when extended and crawling (Fig. 1, a-c). They resemble the drawing of the living animal made by Strubell and published by Bücking (1933: pl. 2, Fig. 1; copied by Odhner, 1938: Fig. 5), with the exception of the attitude in which the tentacles are held, and the shape of the visceral sack ("Eingeweidesack"). Our drawings are ink stipple renderings traced from color photographs of actively crawling specimens, and therefore accurately represent the outline of the living animal including the shape of the visceral sack and the usual position of the tentacles.

Strubell's original sketch gives the impression that (1) the visceral sack is more or less auriculate anteriorly and thus shaped somewhat like a cordate leaf, and (2) the hepatic diverticula are visible as a rather distinct system of veins marking the surface of the visceral sack. Neither is the case in the specimens from Palau. The visceral sack has the shape shown in Figure 1, a-c, and has a perfectly smooth surface. There are no auriculate expansions at the anterior margin of the sack.

In life, the Palauan specimens were deep olive green, rather blotchy in the visceral sack, which is also flecked with white. The head and anterior part of the body in front of the attachment of the visceral sack are somewhat paler and streaked in the manner shown in Strubell's sketch. An oval, darker green area at the anterior end of the visceral

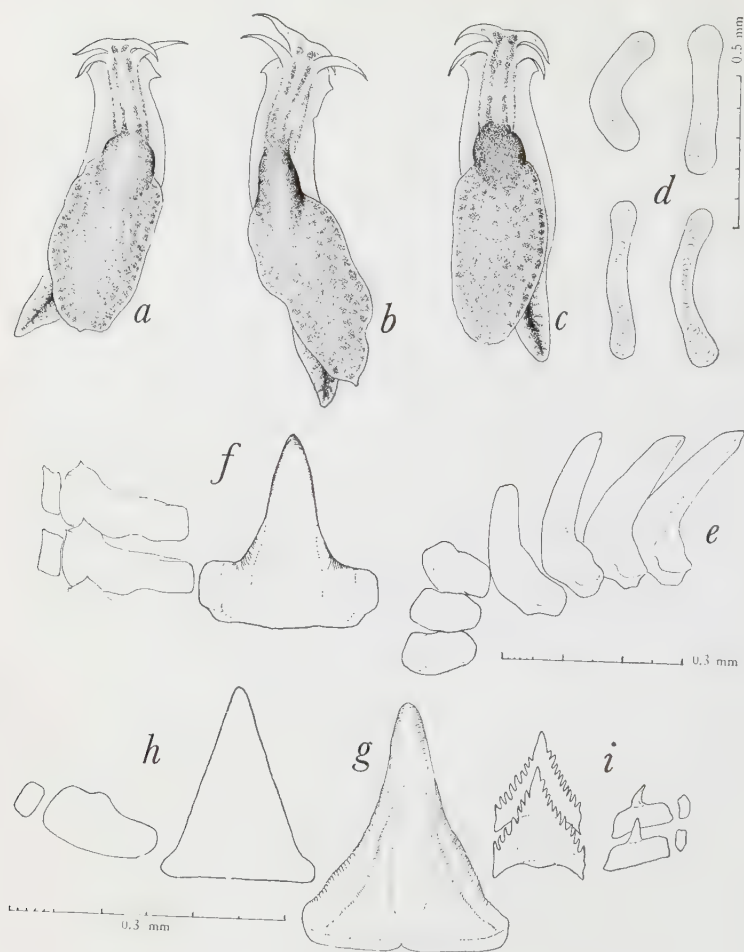


FIG. 1

sack indicates the position of the visceral mass. To judge by Strubell's figure, his specimens were a paler, brighter green than were the animals collected in Arakitaoh stream.

Measurements were not taken of the living specimens, due to pressure of time, and the preserved animals are so contracted and distorted that detailed measurements are not especially informative. However, the dimensions of some of the conspicuous features in topographic anatomy are given below in tabular form. The measurements of specimens collected in 1957 differ somewhat from the figures given for material taken

in 1958 owing to the fact that the latter were anesthetized by various means prior to fixation in formalin and have therefore retained more nearly normal shape.

Measurements (in mm) of *Acochlidium amboinense*

	TOTAL LENGTH	LENGTH OF VISCERAL SACK	WIDTH OF VISCERAL SACK	LENGTH OF FOOT	WIDTH OF FOOT
12 Sept. 1957	9	—	6	—	4
	9	—	6	—	4
	9	—	6	—	4
	9.5	—	7	—	4
	10	—	8	7	4.5
16 Sept. 1957	6	—	6	—	3.5
	8	—	5	—	4
	8	—	7.5	—	—
	10	—	5	6	4
2 Oct. 1958	11	—	8	—	4
	12	7	6	9	4
	12	9	6	10	4
	13	8	6	11	4
	14	10	9	10	4
	15	9	7.5	11	4.5
	16	12	7	7.5	4
	16	11	8	11	4.5
	—	9	8	12.5	—
	—	—	—	—	—

(Blanks indicate that the character was not measured because of distortion.)

Radula: According to Bücking's observations (1933: 558 et seq, Figs. 2a, 3, 4 and 5) the radula is bent around the lingual muscle and assumes the shape of the letter U lying on its side. It consists of five longitudinal rows: a middle row of teeth, on either side of which are two lateral rows of plates of chitinous material, which extend only along the ventral portion of the radula to the point where it bends back upon itself over the anterior end of the lingual muscle. In face view, the rachidian tooth is in the shape of an acute isosceles triangle 0.2 mm (200 micra) high and 0.15 mm (150 micra) wide. The thick, slightly curved cusp bends sharply backward from the base of the tooth, which is somewhat expanded laterally. There are no processes or thorns on the margin of the tooth. The inner lateral plates are all of irregular quadrangular form with rounded angles, measuring 0.04×0.11 mm; at the middle of the upper (i.e., posterior) margin they have a short "nasenartigen" process. The plates of the outer row are thin, small (0.02×0.025 mm) and are practically square.

Bücking records 52 rachidian teeth (24 on the ventral part of the

radula, 28 on the dorsal), 20 inner laterals in each row, and 10–15 outer laterals, a total of 112–122 teeth and plates in the complete radula.

Our observations upon the radulae of Palauan specimens agree in general with Bücking's description except as follows: the rachidian teeth measure about 0.27 mm in height instead of 0.2 mm; their sides are concave and finely serrated (Fig. 1 g), not straight and smooth, and when viewed in position on the radula the backward-bent cusp is much narrower than the base (Fig. 1 f). The wide, inner lateral plates bear a blunt process, with or without two or three denticles, toward the outer end, not the middle, of the upper margin; the lower edge of the following plate is recessed to accommodate this process. The small, squarish outer lateral plates often have a tiny denticle at the two upper corners (Fig. 1 f).

Contrary to Bücking's observations, inner lateral plates are present in all transverse rows, and the small outer lateral plates are present in all but the 10 youngest transverse rows where they have not yet been formed. In one of our preparations, the radula has 25 rachidian teeth with cusps completely worn off (those of the ventral part of the radula; see Fig. 1 e), 1 very much blunted by use, and 30 quite sharp and unworn (in the dorsal part of the radula), a total of 56; inner lateral plates are present in all 56 transverse rows, a total of 112; and outer laterals are completely formed in all but the 10 youngest rows (and even in these rows the outlines of the still incomplete plates can be seen), a total of 92 fully formed plates. The number of teeth and plates in the complete radula is therefore 260 ($56 + 112 + 92$).

It seems to us reasonably certain that these discrepancies are due to deficiencies in Bücking's observations rather than to any specific difference between our material and his. The outer rows of the radula are very delicate, especially toward the growing end, and the plates easily could have been overlooked if not completely torn off in the process of dissection. Moreover, Bücking's most detailed figures were drawn at such a low magnification that the marginal ornamentation of the rachidians was not noticed.

The radula of *Acochlidium weberi* as illustrated by Bergh shows a strong, triangular rachidian and two rows of lateral plates, as in *A. amboinense*. Aside from being smaller, the rachidian differs in having a conspicuously denticulated cusp, and the inner laterals bear a much stronger cusp situated in an approximately central position (Fig. 1 i). For the sake of comparison, Bergh's and Bücking's figures have been redrawn (Fig. 1, h and i) to the same scale as our own drawings (Fig. 1, f and g).

Spicules: A large number of spicules are situated in a ring around the esophagus and in the tissue of the foot, but not in the visceral sac. These bodies are transparent, cylindrical rods up to 0.5 mm in length, more or less bent and usually somewhat enlarged at the ends (Fig. 1 d). They are almost crystal clear, with only a slight milkiness, but a distinct core and evidence of concentric lamination can be seen in most of them. In

polarized light they show very slight birefringence. Spicules cannot be found in specimens preserved in formalin but they are conspicuous in alcoholic material, from which they can be dissected without difficulty. Although unaffected by alcohol, they dissolve readily and rapidly (in a matter of minutes) in ordinary tap water. They also suffer changes when mounted in balsam, but not uniformly. In a single preparation, some spicules may show signs of disintegration, whereas others remain unchanged. Further studies should be made to determine the nature and composition of these bodies.

Measurements of radular teeth and plates of *Acochlidium* (in mm)

	<i>A. weberi</i> ^o		<i>A. amboinense</i> [†]		<i>A. amboinense</i> (Palau)	
	Height	Max. width	Height	Max. width	Height	Max. width
Rachidian	0.11–0.12	0.09–0.1	0.2	0.15	0.24–0.27	0.22
Inner lateral	—	0.075	0.04	0.11	0.09	0.12
Outer lateral	—	0.02	0.025	0.02	0.055	0.03

^o Measurements from Bergh.

[†] Measurements from Strubell, converted from micra.

Genital armature: According to Bücking's observations, the margin of the glans penis is furnished with a ring of about 15 hooks and thorns of a chitinous substance. His figure 7a shows 9 large thorns and 9 smaller hooks forming an incomplete ring around the glans. Our specimens, all of which are more or less contracted, show a semicircle of 14 large thorns in two rows around one side and 8 (in one specimen the base of a 9th, which seems to have been broken off, is clearly visible) smaller, slender hooks in a cluster on the opposite side. Terminal and lateral views of the most fully expanded preparation we were able to obtain are shown in Figure 2. Whether or not the double row of thorns and the cluster of hooks would spread out and form a single row during full expansion we are unable to say.

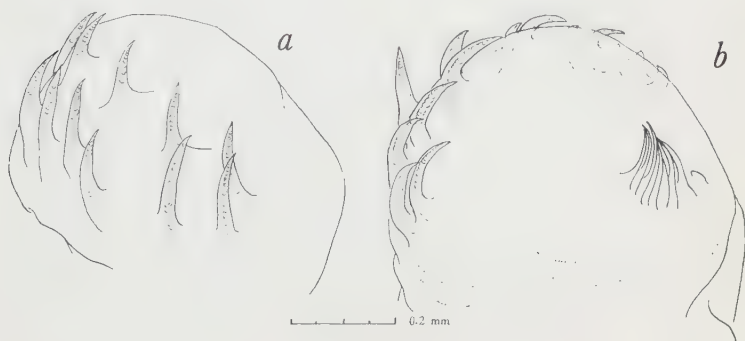


FIG. 2

Bücking does not describe the thorns and hooks in detail, saying only that the latter resemble shark's teeth in form and have the base drawn out into four hook-like processes. We have been unable to discern four basal processes, but the large thorns are joined to the integument by a pair of diverging roots. Bücking does not mention that each of the thorns is invested in a sheath of tissue from which a small part of the very sharp tip protrudes, as is the case in our material.

The structure of the hooks and thorns is similar to that described by Bergh (1895) for *Hedyle weberi*, although the thorns in that species, too, have three or four simple or branched roots. Both hooks and thorns are hollow, with a distinctly chambered core. In specimens of *H. weberi* 3 cm in length, the penis was from 3 to 8 mm long, with 15–20 hooks (corresponding to the thorns in Bücking's description) in a single row, and many smaller, more thorn-like hooks in two (here and there 3 or 4) rows. In Bücking's specimens of *Acochlidium amboinense*, as in ours, this organ was of somewhat more modest proportions.

Habitat and ecology: All specimens here reported were collected in the south fork of Arakitaoch stream in Airai Municipality on the lower west coast of Babelthuap, the largest island of the Palaus. The habitat is restricted to a very short "cascade zone" where the stream flows across exposed basaltic bedrock at an elevation of 150–190 feet above sea level (Fig. 3). The water was fresh (NaCl 17 parts per million) and had a temperature of 79°F at the time the specimens were collected.



FIG. 3

The specimens invariably were found on the few loose rocks that were lying in the shady stream bottom, covered by 1-12 inches of water; they were not found under the rocks or on the solid rock of the stream bed.

Of particular interest is the fact that *Acochlidium* were not found in the corresponding situation in the north fork of Arakitaoch stream, which, to all appearances, was ecologically identical. Neither were these snails found in the lower graded reaches of the stream or in the upper mangrove zone where the water becomes brackish, although these sections of the stream were collected and inspected with great care.

The fauna associated with *Acochlidium amboinense* in the cascade zone of Arakitaoch stream includes nine species of fishes (identified by H. A. Fehlmann), as follows (the most abundant are indicated by an asterisk):

- Anguillidae: *Anguilla marmorata* Q. & G.
- Gobiidae: *Stigmatogobius romeri* (M. Weber)*
- Sicyopterus micrurus* (Blkr.)
- Stiphodon elegans* (Steind.)*
- Sicyopus zosterophorum* (Blkr.)
- Sicyopus* n. sp.*
- Eleotridae: *Eleotris fusca* (Bl. Schn.)*
- Ophiocara aporos* (Blkr.)
- Bunaka gyrinoides* (Blkr.)

Other animals associated with *Acochlidium* are the water striders *Microrovelia notophora* Esaki, endemic in the Palau Islands, and a species of *Limnometra* (both determined by Jon L. Herring). Crickets of the genus *Tremellia* (family Gryllidae) also were abundant in the cascade zone, although they must have hidden themselves along the banks of the stream for they were rarely seen except after poisoning with rotenone when the crickets were dying and hopping around like pop corn. Aquatic lepidopteran larvae of the family Pyraustidae must also be common in the cascade zone, for they were found in large numbers in the stomachs of the common mountain goby (*Sicyopus* n. sp.), but they were not observed in the stream. A few nymphs of Ephemeroptera and Odonata were found under stones in the pools of the cascade zone.

Several species of shrimps (identified by L. B. Holthuis) were collected in the pools with *Acochlidium*, of which the most abundant were *Macrobrachium lar* (Fabricius) and *Atya pilipes* Newport. Present but scarce were *Macrobrachium placidulum* (de Man), *Atya spinipes* Newport, *Caridina typus* H. Milne Edwards, and *Caridina weberi* De Man, for which optimum conditions are probably located elsewhere in the stream. The grapsoid crab *Varuna litterata* (Fabricius) was also present (identified by Fenner A. Chace).

Other gastropods present were *Neritina pulligera* Lamarck and *N. cornea* Linnaeus, and unidentified species of *Stenomelania* and *Thiara*. The Neritinas were breeding freely and their egg cases bedecked their own shells and were found in patches all over the bedrock bottom of the stream. Egg cases and young snails were found only in this zone.

Zoogeographical remarks: The discovery of this distinctive freshwater opisthobranch on a high island well out in the Pacific Ocean, hundreds of miles from the type locality and considerably removed from other high islands where it conceivably could occur, is noteworthy in itself. When the biology of the animal has been thoroughly investigated, the zoogeographic implications of its distribution may assume considerable significance. A study of its life history, to determine whether or not there is a free-swimming marine larval stage to account for its distribution in fresh water on widely separated high islands obviously would be of the utmost importance. It will also be necessary to test the physiological tolerances of the adult animals to evaluate the possibility of chance dispersal through natural or artificial means, although the delicate body form and the ecologically restricted distribution do not speak for the exceptional lability and hardiness that such means of transport certainly would require.

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EXPLANATION OF FIGURES

Fig. 1. a-h, *Acochlidium amboinense* Strubell: a-c.—Animals extended and crawling; drawn from photographs. Actual length about 2.5 cm. d.—Spicules (enlarged according to adjacent 0.5 mm scale). e.—Rachidian teeth of portion of radula in region of active use; side view (enlarged according to 0.3 mm scale below). f.—Rachidian tooth and plates of one side of the radula; in situ (enlarged according to 0.3 mm scale below h). g.—Rachidian tooth dissected from radula; full face view (enlarged according to 0.3 mm scale below h). h.—Rachidian tooth and plates of one side of the radula (redrawn from Bücking to the same scale as Figs. f and g). i.—*Acochlidium weberi* (Bergh). Rachidian teeth and plates of one side of the radula (redrawn from Bergh to the same scale as Figs. f, g and h).

Fig. 2. *Acochlidium amboinense* Strubell. Retracted glans penis showing armature: a.—in lateral view. b.—in subterminal view.

Fig. 3. Arakitaoh Stream, Airai Municipality, Babelthuap, Palau Islands: cascade zone in south fork of stream, habitat of *Acochlidium amboinense* Strubell. Photo by H. A. Fehlmann, 12 Sept. 1957.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

SAEDELEERIA, NEW GENUS OF THE FAMILY
ALLOGROMIIDAE (FORAMINIFERA)

BY ALFRED R. LOEBLICH, JR. AND HELEN TAPPAN
*California Research Corporation, La Habra, California and
University of California at Los Angeles*

The genus *Diplogromia* was described by Rhumbler (1904: 214) as differing from *Gromia* Dujardin in the character of the pseudopodia, and in having a double walled shell. Included in *Diplogromia* were the species *Gromia brunneri* Blanc, 1886, and *Gromia gemma* Penard, 1889. No type was originally cited for the genus, and Cushman (1928: 60) selected *Gromia brunneri* Blanc as type by subsequent designation.

De Saedeleer (1932: 67) emended *Diplogromia*, apparently overlooking Cushman's earlier type designation, and restricted *Diplogromia* to include only *Gromia gemma*. He proposed the new genus *Allelogromia*, with *Gromia brunneri* Blanc as type species. Thus *Allelogromia* is a junior objective (isogenotypic) synonym of *Diplogromia* Rhumbler, 1904.

In recent publications *Diplogromia* has been included as a synonym of *Gromia* by some authors (Jirovec, 1953: 329; Kudo, 1954: 472), but both *Diplogromia* and *Allelogromia* were recognized by Deflandre (1953: 140), with *Gromia gemma* included in *Diplogromia*, and *Gromia brunneri* in *Allelogromia*. No comment was made as to the type species of *Diplogromia* or *Allelogromia* however.

Inasmuch as *Gromia brunneri* had been fixed as the type of *Diplogromia* in 1928 (Cushman) and *Allelogromia* De Saedeleer, 1932, is thus a junior synonym, the generic taxon including *Gromia gemma* is left nameless, and *Saedeleeria* Loeblich and Tappan, new genus, is hereby proposed for it.

Diplogromia Rhumbler, 1904, type species *Gromia brunneri*

Blanc, fixed by subsequent designation by Cushman (1928: 60) contains the additional species *Gromia squamosa* Penard, 1888, and *G. nigricans* Penard, 1902.

Gromia linearis Penard, originally included in *Allelogromia* by De Saedeleer, was made the type species of *Penardogromia* Deflandre (1953: 140).

Saedeleeria Loeblich and Tappan, new genus

Diplogromia Rhumbler of DE SAEDELEER, 1934 (not *Diplogromia* Rhumbler, 1904), Mus. Roy. d'Hist. Nat. Belgique, Mém. 60: 67.

Type species: Gromia gemma Penard, 1889. Monotypic.

Granulo-reticulose pseudopodia, asymmetrically developed as a pseudopodial "peduncle" in the apertural region; single chambered test with thick double-layered wall, outer layer with granular inclusions, inner layer homogeneous and hyaline; aperture rounded, with asymmetrical inverted neck.

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PROCEEDINGS
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A NEW CONIFER FEEDING APHID
FROM WASHINGTON

By F. C. HOTTES

I wish to thank Dr. George Knowlton for sending me this species to determine.

Cinara wahsugae, n. sp.

Apterous viviparous female: Length 2.4 mm. Length of hind femora 1.42 mm. Length of hind tibiae 1.92 mm. Length of hind tarsal segments .105-.12 and .31 mm. Color not recorded, but cleared specimens have the head, thorax and abdomen brownish with the cornicles dark dusky brown. Antennal segments three, four and five pale except for light brown at the apex. Sixth segment brown. Femora pale at base, shading to dusky brown at apex. Hind tibiae pale tan to mid region, shading to dark brown on distal half. Pro- and mesothoracic tibiae pale except for short region near apex.

Length of antennal segments as follows: III .49 mm, IV .18 mm, V .22 mm, VI .13 + .05 mm. Third antennal segment without sensoria. Fourth antennal segment with primary sensorium. Fifth antennal segment with one secondary sensorium and the primary. Hair on antennae fine, sparse, varying from .05-.75 mm in length, set at angle of about forty-five degrees. Hairs on vertex of head about two times the length of the hairs on the antennae. Median transverse suture very dark. Ocular tubercles small. Hairs on metathoracic tibiae almost sparse, spaced for the most part not closer than their length on the outer margin and only slightly closer on the inner margin. The hairs are fine, set at an angle of about forty-five degrees and about .05 mm in length. Cornicles with outer margin very irregular. Cauda triangular in shape with numerous long hairs.

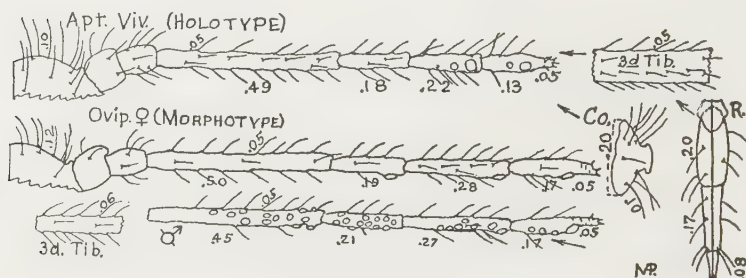
Oviparous female: This form is very similar to the viviparous female in form. The sensoria on the metathoracic tibiae are few, limited to the basal third of segment which is hardly swollen.

Alate male: The male of this species is poorly represented. Palmer has reconstructed the very much shriveled antenna.

Holotype: Apterous viviparous female. Morphotype: oviparous female. Allotype: alate male. All types mounted on the same slide, which has been deposited in the United States National Museum. Collected by

W. W. Baker on "Hemlock" (*Pseudotsuga*) Victor Falls, Washington, 19 August 1936.

Remarks: This species may be easily differentiated from other known species from this host by the character of the hairs on the metathoracic tibiae, they not being spine-like as in *taxifoliae* (S), and fewer and more widely spaced than in *pseudotsugae* (W) and *pseudotaxifoliae* Palmer. In the oviparous female of this species the sensoria do not extend to the apex of the metathoracic tibiae.



PROCEEDINGS
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NOTES ON AND A KEY TO THE SPECIES OF
CINARA (FAMILY APHIDAE) LIVING ON
PINUS EDULIS

By F. C. HOTTES

In 1919 Wilson gave notice that he had under preparation a Monograph of the *Lachninae* of North America, a group to which the genus *Cinara* belongs, but at that time looked upon as a synonym of *Lachnus*. We now know that Wilson's projected Monograph was already moribund, but for years his announcement kept alive the hope of its ultimate publication, and perhaps prevented others from undertaking the project. Since that time many new species have been described within the genus *Cinara* and it is felt that something less pretentious than a Monograph will serve a useful purpose until such a time when one can be undertaken.

Because species of the genus *Cinara* have either specific or closely allied species of *Coniferae* as hosts, it has seemed logical to use the host species as media to divide the species of the genus into more workable groups, hence this section of species which have *Pinus edulis* and *Pinus monophylla* for their host plants.

The genus *Cinara* was erected by Curtis in 1835. It has *Aphis pini* Linnaeus as type, by action of the International Commission on Zoological Nomenclature. (Opinion number 399, 1956.) For various reasons the name *Cinara* was not used by systematists for almost a hundred years, species being placed in the genus *Lachnus* erected by Burmeister in 1835. Lack of space here prevents full discussion concerning the use of these two generic names, and their type species in the past and present, but those desiring to pursue the subject further may find the articles by Hottes as published in the Bulletin of Zoological Nomenclature, 9(6): 166-182, 1954 and the rul-

ings of the Commission as published in the same Journal in 1956 useful.

More recently Börner has proposed a number of genera which aphidologists in America would normally place in the genus *Cinara*. At the present I do not accept or reject the genera which Börner coined from the genus *Cinara* as used in America, but it would seem that most if not all of these genera would serve a more useful purpose if viewed as subgenera.

A KEY TO APTEROUS VIVIPAROUS FEMALES OF THE GENUS *CINARA* WHICH HAVE *PINUS EDULIS* AND *PINUS MONOPHYLLA* AS HOSTS

1. Fourth segment of the rostrum .30 mm or more in length 2
Fourth segment of the rostrum less than .25 mm in length 3
2. Fourth segment of the rostrum longer than the third antennal segment *C. puerca* Hottes
Fourth segment of the rostrum shorter than the third antennal segment *C. tanneri* (Knowlton)
3. Hairs on ventral surface of first metatarsal segment longer than width of segment 4
Hairs on ventral surface of first metatarsal segment shorter than width of segment 5
4. Cornicles with base varying from .27-.37 mm
..... *C. atra* (Gillette and Palmer)
Cornicles with base varying from .18-.21 mm *C. poketa* Hottes
5. Width of base of cornicles .25 mm or less 6
Width of base of cornicles .27 mm or more 7
6. Metathoracic tibiae with extensive pale area *C. caliente* Hottes
Metathoracic tibiae without pale area *C. poketa* Hottes
7. Hairs on outer surface of metathoracic tibiae varying from more than 45 degrees to 90 degrees 8
Hairs on outer surface of metathoracic tibiae set at angle of 45 degrees or less 13
8. Fourth antennal segment without sensoria *C. nitidula* Hottes
Fourth antennal segment with at least one sensorium 9
9. Hairs on metathoracic tibiae fine 10
Hairs on metathoracic tibiae coarse 11
10. Hairs on metathoracic tibiae almost at right angles, hairs on tibiae and antennae not numerous *C. rustica* Hottes
Hairs on metathoracic tibiae not almost at right angles, hairs on tibiae and antennae numerous *C. pinata* Hottes
11. Third antennal segment not over .33 mm in length
..... *C. nitidula* Hottes
Third antennal segment over .35 mm in length 12
12. Dorsum of abdomen, anterior to transverse pigmented areas, free from pigmented spots *C. terminalis* (Gillette and Palmer)

- Dorsum of abdomen, anterior to transverse pigmented areas, with irregular pigmented areas *C. wahtolca* Hottes
13. Hairs on metathoracic tibiae not over .04 mm in length 14
Hairs on metathoracic tibiae over .04 mm in length 15
14. Hairs on metathoracic tibiae blunt at end, hairs on dorsum of abdomen extremely short and blunt ... *C. atra* (Gillette and Palmer)
Hairs on metathoracic tibiae sharp pointed, hairs on dorsum of abdomen not extremely short, sharp pointed
..... *C. apacheca* Hottes and Butler
15. Hairs on vertex of head blunt, extremely short
..... *C. atra* (Gillette and Palmer)
Hairs on vertex of head not extremely short 16
16. Cornicles with base measuring up to .60 mm *C. edulis* (Wilson)
Cornicles with base measuring less than .40 mm 17
17. Pale area on metathoracic tibiae measuring about .45 mm, pigmented areas anterior to transverse pigmented areas large and block-like *C. pinona* Hottes
Pale area on metathoracic tibiae .60 mm or more, pigmented areas anterior to transverse pigmented areas absent or fragmented *C. metalica* Hottes

Cinara apacheca Hottes and Butler

Cinara apacheca Hottes and Butler 1955. Proc. Biol. Soc. Washington, 68: 65-66. Original descriptions of alate and apterous viviparous females.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 70 and figs.

Holotype and morphotype in the United States National Museum.

Size range apterous viviparous females 2.93-3.00 mm.

This species, known only from the first collection, may be easily identified in the mounted state. The short, heavy, strongly curved hairs on the metathoracic tibiae are spaced so close as to be almost fur-like. The cornicles have a very irregular margin which is much closer to the orifice in the posterior region than elsewhere. Hairs on the cornicles are scarce. The hairs on the anterior margin of the metathoracic tibiae are spine-like. Specimens of this species may be taken on the twigs among the needles of young vigorous trees. Repeated trips have been made to the type locality for more material without success.

Cinara atra (Gillette and Palmer)

Lachus ater (Gillette and Palmer), 1924. Ann. Ent. Soc. America, 17: 37-39, figs., plates XII and XIII. Original description of all forms.

Type in United States National Museum.

Size range apterous viviparous females 2.00-3.00 mm.

This black or dark brown species is free from all powder. Apterous specimens of this species have the thorax rather long and narrow, distinctly neck-like. Body hairs are very sparse and extremely short and

squarably cut at the end. Hairs on the tibiae and tarsal segments are subject to much variation as to length and condition at the end, being squarably cut at the end if short or sharp pointed if long. Hairs on the outer margin of the tibiae often differ from those on the inner margin as to length and condition at apex. When in good view and not worn, the hairs on the ventral surface of the first metatarsal segment are longer than the width of segment with the terminal hairs strongly bent or hooked.

Specimens of this species seem to show a preference for young, vigorous trees where they feed on the smooth bark of small branches. The colonies are never large.

Cinara caliente Hottes

Cinara caliente Hottes, 1955. Proc. Biol. Soc. Washington, 68: 197-199, figs. Original description of all forms.

Holotype, morphotypes and allotype in the United States National Museum.

Size range apterous viviparous females 2.02-2.17 mm.

This trim little species is probably more widely distributed than collection records indicate. Because of its small size and protective coloration which is exactly the same color as the needle-free color of the bark of twigs upon which it feeds, this species is extremely difficult to detect. It is one of the most easily determined species of the group feeding on *Pinus edulis* and *Pinus monophylla*. It has extensive pale areas on the metathoracic tibiae and femora, and the third antennal segment is mostly pale. The cornicles are small and almost hair free, with the outer margin very irregular. In Colorado, I have only taken it in the type locality north of Delta. In September 1959, I took it near Springerville, Arizona; these specimens were almost black. R. C. Dickson has sent me material from California taken on *Pinus monophylla*. The California material for the most part lacks the wart-like pigmented areas on the dorsum of the abdomen. This material is slightly larger than the Colorado material, has the outer margin of the cornicles more regular and a few more hairs on the cornicles.

Cinara edulis (Wilson)

Lachniella edulis (Wilson), 1919. The Canadian Entomologist, 51: 44-45. Original description apterous and alate viviparous females.

Lachnus edulis (Wilson). Palmer, Ann. Ent. Soc. America, 19: 314-317, pls. XXVII and XXVIII. Descriptions of all forms.

Cotypes, Granovsky and Colorado Agricultural Experimental Station Collections.

Size range apterous viviparous females 3.00-4.00 mm.

This species, the first to be described from *Pinus edulis*, has also been recorded from *Pinus monophylla*. It is widely distributed. I am not sure that all records for this species apply to it. Some colonies of this species

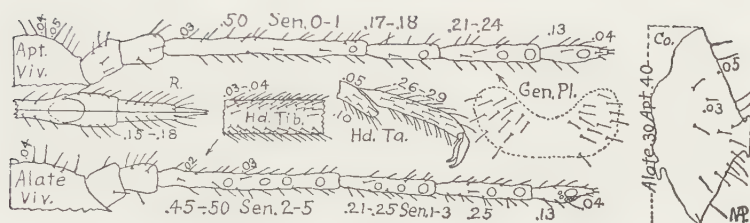


FIG. 1

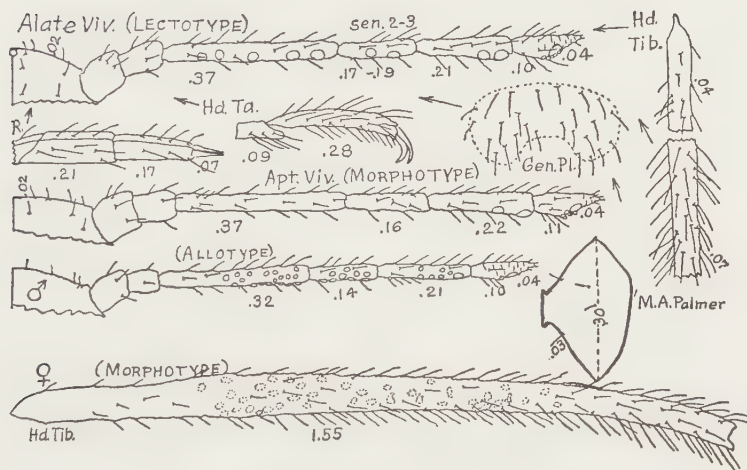


FIG. 2

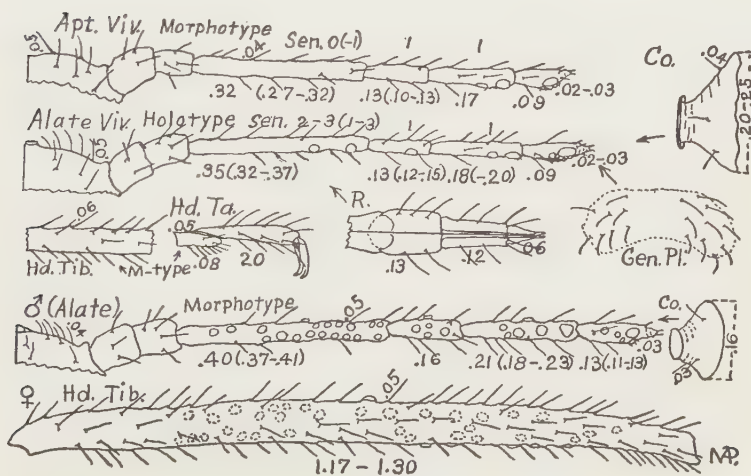


FIG. 3

are jet black, shining, with a well-marked median line of powder. Some are jet black without the median line; such have coarse hairs on the dorsum of the abdomen. Other colonies are more of a gun-metal color with an indistinct median line of powder. I am aware of other color variations. The relative length of the fourth and fifth antennal segments of *edulis* as now determined are also confusing, as well as the character of the hairs on the tibiae. Perhaps we are dealing with several emergent species.

Palmer (1926) indicates powder anterior to the cornicles of the apterous viviparous female in her figure, but makes no mention of these patches in her text—in fact, ruling them out. In 1952 Palmer gives the common name "The Black and White Spotted Pinyon Pine Aphid" to this species. It is hardly suitable.

When in good view the mesosternal tubercle is very well developed, being almost as wide as long with the apex truncate.

This species is as a rule found in large colonies. It seems to show a preference for the needle-free bark of older branches or the trunks of young trees.

Cinara metalica Hottes

Cinara metalica Hottes, 1956. Proc. Biol. Soc. Washington, 69: 85–87.

Original description of oviparous female and alate male.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 222, figs.

Holotype and allotype in the United States National Museum.

Apterous viviparous female: Similar in size to oviparous female. Head and thorax lightly pruinose, abdomen to region of cornicles irregularly pruinose. Cornicles brownish bronze more or less two toned, with the constricted area darker. Dorsum of abdomen posterior to cornicles bronze and highly polished. Antennal segments with the following lengths: III .28–.42 mm (as a rule .39 mm or less), IV .15–.18, V .18–.21, VI .09 + .04 mm. Sensoria distributed as follows: II none, IV none or with one, V one. Mesosternal tubercle well developed; not truncate, but more or less nipple-like. Hair on antennal segments rather sparse, set at an angle of about 45 degrees or slightly more; not much if any longer than width of segment. Length of hind tibiae about 2.55 mm. Hairs on hind tibiae numerous, set at an angle of less than 45 degrees and shorter than width of segment (longest about .045 mm to almost .06 mm). Metathoracic tarsal segments .09 and .18–.21 mm. Cornicles two toned about .30–.32 mm with the outer rim very irregular; as a rule with one or more clear areas, provided with few hairs. Transverse pigmented areas anterior to cauda provided with a single row of hairs along the posterior margin. Pigmented areas anterior to transverse pigmented areas as a rule absent; when present, fragmented and small.

Morphotype: Apterous viviparous female taken at Springerville, Arizona, the type locality, but reared at Grand Junction, Colorado, 26 September 1956. Deposited in the United States National Museum.

Size range apterous viviparous females 3.37–3.60 mm.

This species may be easily identified in the field. No other species on

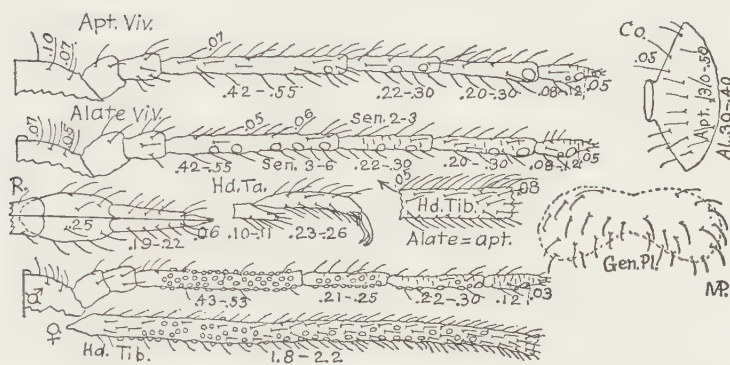


FIG. 4

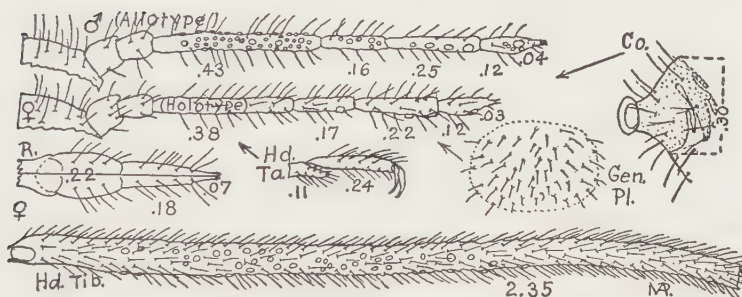


FIG. 5

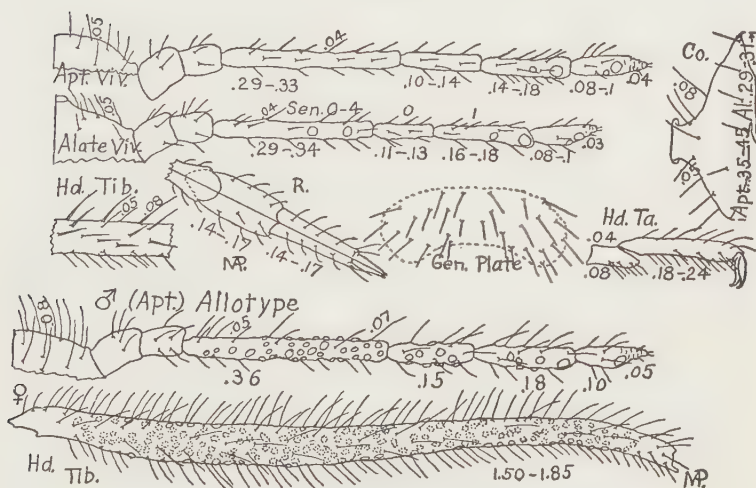


FIG. 6

Pinus edulis has the abdomen so mottled with pruinose and the cornicles and tip of abdomen with such a metallic luster. The mesosternal tubercle is well developed. The male of this species was described as alate although the wings were vestigial. Since the first male was taken, two other males have been reared in Grand Junction from material taken in Arizona. They also have vestigial wings. The mesothoracic wings are flap-like and about .15 mm in length with the basal portion thickly clothed with hairs. The metathoracic wings are slightly longer but finger-like and free from hairs. The sensoria on the antennae of the males of this species are more tuberculate and fewer in number, as well as smaller than the sensoria of the males of *C. pinona*.

Specimens of this species seem to prefer the young, vigorous trees with greenish bark. Here they live on the younger branches among the needles. Colonies of this species are often mixed with *C. rustica* Hottes.

Cinara nitidula Hottes

Cinara nitidula Hottes, 1954. Proc. Biol. Soc. Washington, 67: 256-258.

Original description alate and apterous viviparous females.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 91-92. Description of apterous male and oviparous female.

Hottes, 1956. Proc. Biol. Soc. Washington, 68: 72, figs.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 223, figs.

All types in the United States National Museum.

Size range apterous viviparous females 2.02-2.29 mm.

This rather small species varies from various shades of brown to almost if not quite black; both the thorax and the abdomen are highly polished, only the sides of the thorax being provided with powder. The fourth antennal segment lacks sensoria in both the apterous and alate viviparous females; sensoria are also lacking on the third segment of the apterous viviparous females. The hind tibiae have a rather extensive pale area, and the hairs are rather coarse and upstanding. From near the base to well beyond the middle of the tibiae the hairs are spaced nearly as far apart as their length. This species appears to be allied to *C. terminalis* but differs from that species in color, smaller size, more extensive cornicles which are also much darker, and from most *terminalis* in having shorter hairs on the tibiae.

This species seems to be very specific in its host requirements. It can only be taken on older terminal branches of mature trees which have a yellow bark and large scales among which they may be taken.

Cinara pinata Hottes

Cinara pinata Hottes, 1955. Proc. Biol. Soc. Washington, 68: 199-202, figs. Original description of all forms.

Holotype and other types in the United States National Museum.

Size range apterous viviparous females 2.97-3.36 mm.

The most outstanding feature of this species is the abundance of hairs

on the antennal segments, on the third segment averaging about 45, and the short, thick, stubby sixth antennal segment which is provided with numerous hairs.

This species is rather common in its type locality where it lives in large colonies on the smaller terminal branches among the needles. I have only taken it on older trees where the branches have a yellowish bark and large scales, and when these qualifications are met, it may be easily reared.

Cinara pinona Hottes

Cinara pinona Hottes, 1953. Proc. Biol. Soc. Washington, 66: 153-155.

Original description of apterous and alate viviparous females.

Hottes, 1954. Proc. Biol. Soc. Washington, 67: 90-91. Description of alate male and oviparous female.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 104 figs. of all forms.

Holotype and other types in the United States National Museum.

Size range apterous viviparous females 3.14-3.26 mm.

This dark brown species has been seen frequently in its type locality since being described; it has also been taken in Mesa Verde National Park. Specimens of this species seem to prefer older trees whose bark is brownish, and whose twigs are more or less yellowish with large yellow scales, but they may also be taken on younger trees. The specimens live in large colonies on the twigs among the needles. Living specimens may be easily separated from *C. metalica* because of the high polish and color and lack of metallic luster on the cornicles and apex of abdomen. Mounted specimens are more difficult to differentiate. The males of *pinona* are alate; the males of *metalica* have the wings vestigial so far as known. I suspect that this species has been confused with *C. edulis* in collections. It may be easily separated from *edulis* by the smaller size, smaller cornicles and much smaller mesosternal tubercle, as well as shorter antennal segments. The tibiae have the same color pattern but are not so dark.

Cinara poketa Hottes

Cinara poketa Hottes, 1956. Proc. Biol. Soc. Washington, 69: 220-221 figs. Original description of apterous viviparous female.

Holotype in the United States National Museum.

Size of apterous viviparous female 2.60 mm.

Since this species was described I have made several trips to the type locality in Arizona for more material, all unsuccessful, until the fall of 1959 when I collected what I have determined as this species a mile or so north of Grand Canyon National Park. The specimens were brought to Colorado alive and from them oviparous females have been reared. This species as indicated in the original description is allied to *C. atra* and shows the same variations as *atra* as to hair length on the tibiae and character of the hairs at the apex. *C. poketa* has the cornicles much smaller and the hairs on the vertex much finer than shown by these structures in *atra*. Like *atra*, *poketa* has a narrow thorax.

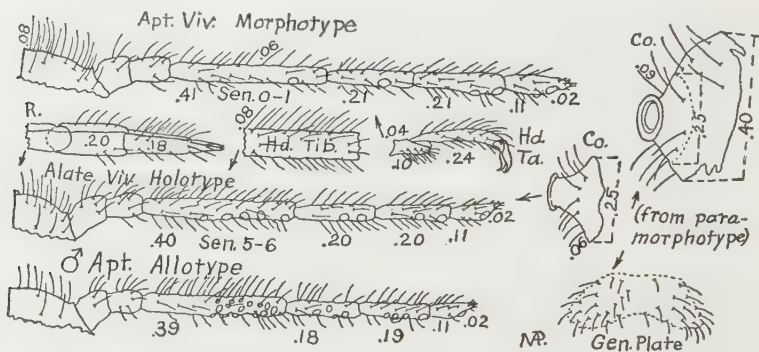


FIG. 7

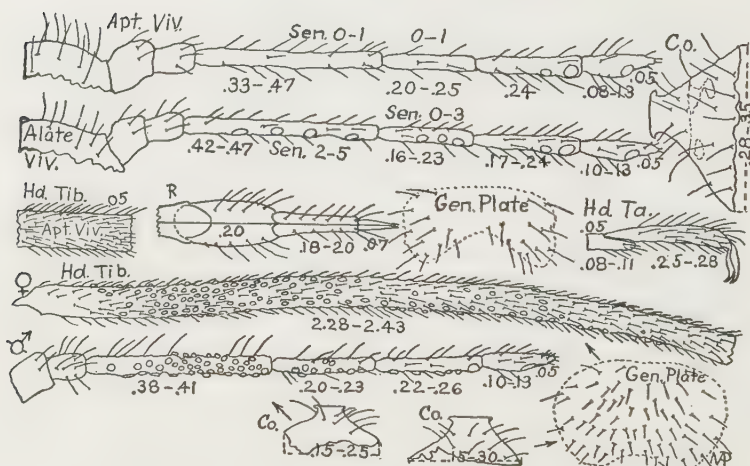


FIG. 8

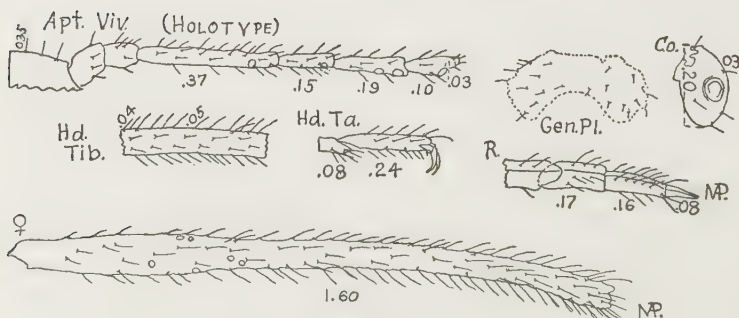


FIG. 9

Oviparous female: Females of this form are much like the apterous viviparous females. The metathoracic tibiae are rather swollen on the basal half, the sensoria are extremely difficult to differentiate and one has the feeling that there are more present than the four or five which may be seen with difficulty. Palmer shows the sensoria much more numerous and extending almost to the end in *C. atra*.

Morphotype: Oviparous female reared from specimens taken in Arizona in September on *Pinus edulis* taken at Grand Junction, Colorado, 20 October 1959. Deposited in the United States National Museum.

Cinara puerca Hottes

Cinara puerca Hottes, 1954. Proc. Biol. Soc. Washington, 67: 251-253.

Original description of apterous viviparous female.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 69-73, figs. Description of alate viviparous female.

Holotype and morphotype in the United States National Museum.

Size range apterous viviparous female 3.00-4.36 mm.

This species is closely allied to *C. tanneri* (Knowlton) and differs from that species in having the fourth segment of the rostrum longer than the third antennal segment, a shorter third antennal segment, and the cornicles not fragmented, and with more hairs. *C. puerca* lives in sheds of either soil or fragmented bark, constructed by ants, or beneath loose scales of bark, or within deep fissures between large scales of bark on the trunks. I have collected this species in Arizona just outside Grand Canyon National Park.

Cinara rustica Hottes

Cinara rustica Hottes, 1956. Proc. Biol. Soc. Washington, 69: 83-85.

Original description oviparous and apterous viviparous females.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 222, figs.

Hottes, 1957. Proc. Biol. Soc. Washington, 70: 14, figs. Description alate viviparous female.

Holotype and morphotypes in the United States National Museum.

Allotype apterous male described herewith deposited in the United States National Museum.

Apterous male: Color of body uniform gray due to light pruinescence. Length from vertex of head to end of cauda varying from 2.35-2.40 mm. Lengths of antennal segments as follows: III .38 mm, IV .15 mm, V .23 mm, VI .10 + .03 mm. Sensoria distributed as follows: III 12-18 plus primary, IV 4-7 plus primary, V 5-8 plus primary, VI one secondary. All sensoria are small and slightly tuberculate. Width of base of cornicles .33 mm. Length of metathoracic tibiae 1.46 mm. Specimen taken on *Pinus edulis*, Grand Junction, Colorado, 20 October 1959, reared from material taken at Springerville, Arizona, the type locality, early in September.

Range in size of apterous viviparous females 3.22-3.37 mm.

C. rustica is a very distinct species. Specimens are very easily identi-

fied in the field or mounted. Live specimens have the head and thorax and abdomen to just posterior to the cornicles gray due to a light but uniform amount of powder. The region just posterior to the cornicles is a dull chocolate brown. Mounted specimens may be determined by their comparatively short, not numerous, hairs on the metathoracic tibiae which are upstanding. The hairs on the antennae and tibiae are fine

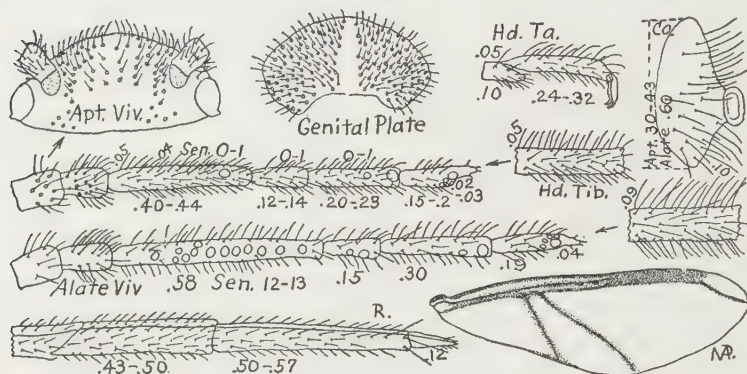


FIG. 10

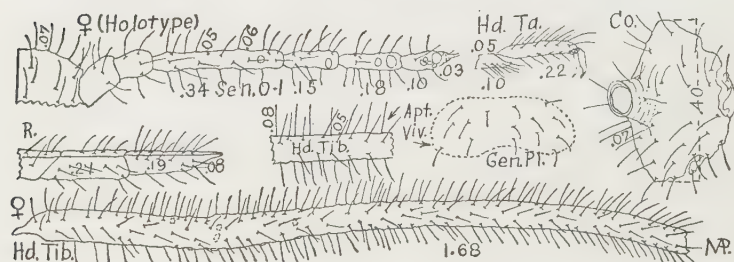


FIG. 11

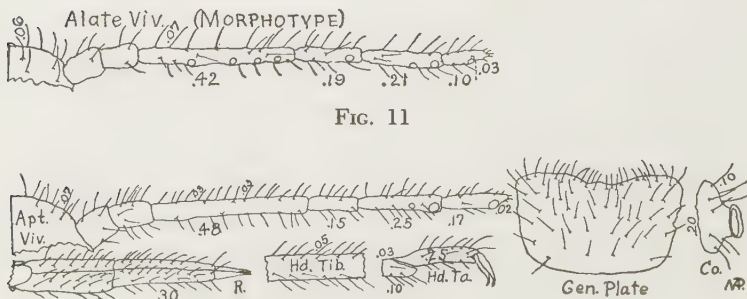


FIG. 12

and rather widely spaced. Colonies of this species are never large, they show a preference for young, vigorous trees where they live on the needle free of more mature twigs, or on the trunks of young trees.

Cinara tanneri (Knowlton)

Lachnus edulis tanneri Knowlton, 1930. The Canadian Entomologist, 62: 155-156, figs. Original description apterous viviparous female. Description of alate not of this species.

Palmer, 1952. Aphids of the Rocky Mountain Region, p. 49. Description of apterous viviparous female.

Hottes, 1954. Proc. Biol. Soc. Washington, 67: 253.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 68, figs.

Lectotype selected by Hottes, but indicated by Knowlton. In Knowlton collection.

Size of apterous viviparous female 4.00 mm.

The material from which Knowlton described this species consists of a mixture of *tanneri* as restricted by Palmer in 1952 and *edulis*. The cornicles of *tanneri* often consist of two distinct parts: a restricted portion as shown by Palmer in the figure published by Hottes which may exist alone, or a restricted portion separate from, but associated with a fragmented basal portion made up of one or more parts which together make up from one fourth to one half of what would be the normal base. The hairs on the cornicles of this species are sparse; those on the antennae and tibiae comparatively so. The fourth segment of the rostrum varies in length from .30-.37 mm but is always shorter than the third antennal segment. Tanner took his material on *Pinus monophylla*. Knowlton has taken it on *Pinus edulis* under loose bark.

Cinara terminalis (Gillette and Palmer)

Lachnus terminalis (Gillette and Palmer), 1924. Ann. Ent. Soc. America, 17: 19-21, figs. Original description all forms.

All types in the United States National Museum.*

Body length of apterous viviparous female 2.25 mm.

This is the only *Cinara* species now known to feed on the young, tender terminal twigs of *Pinus edulis*, specimens being found in this location before the needles have fully developed. I am not sure we are dealing with only one species, because some apterous viviparous females are a pale pea green, while others are a light cinnamon brown. The hairs on the antennae and metathoracic tibiae also show two forms as to length, quality and angle. Palmer (1952) shows the hairs on the metathoracic tibiae longer than the hairs on the metathoracic tibiae of the apterous. I have seen such, and also the reverse. In each case the hairs are quite upstanding.

She has selected as the lectotype the alate viviparous female taken on *Pinus edulis*, Owl Canyon, 5 October 1922 (the only alate taken on this

* Note from Prof. Palmer.

date). "The only fundatrix listed in original description is a nymph, so there is no morphotype of this form. The only summer vivipara mentioned in original description are short haired 'so have to be ruled out till we know otherwise.' The male listed is long haired and I designated as allotype the one of Oct. 18, 1922. Specimen taken in 1923 (in original description is erroneous). The oviparous female mentioned in description Oct. 18, 1922 I seem to have picked for morphotype. The one of Oct. 27, 1921 is recorded as the one drawn from in original publication, but slide is so poor and specimen so faded that it seems inadvisable to use it."

Cinara wahtolca Hottes

Cinara wahtolca Hottes, 1953. Proc. Biol. Soc. Washington, 66: 155-157.

Original description of alate and apterous viviparous females.

Hottes, 1954. Proc. Biol. Soc. Washington, 67: 90. Description of oviparous female.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 91. Description of alate male.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 104, figs.

Hottes, 1956. Proc. Biol. Soc. Washington, 69: 223, fig. of male antenna.

Holotype and other types in the United States National Museum.

Range in size of apterous viviparous females 2.86-2.36 mm.

There is no need to confuse this species with any other species living on *Pinus edulis* or *Pinus monophylla*, yet I have seen slides determined as *edulis* or *terminalis*. Living specimens may have the body quite powdery so that it presents a distinctly gray appearance. At other times specimens are quite free from powder and when such are dark gray. Mounted specimens show the tibial hairs distinctly longer than the tibial hairs of *edulis*, more upstanding, and distinctly spine-like. The tibial hairs in the apterous form are as a rule longer than the tibial hairs of *terminalis* in like form and less upstanding. Neither *edulis* nor *terminalis* have the pigmented spots on the posterior dorsum of the abdomen.

Specimens of this species show a decided preference for young, vigorous trees whose bark is gray or green. On such trees they live on the trunk and the needle-free limbs and small branches. In Arizona, the colonies are large. I have observed *Pinus monophylla* in Nevada heavily infested; Dickson has taken this species in California on the same host.

EXPLANATION OF FIGURES

Plate I: Fig. 1.—*Cinara apachea* Hottes and Butler. Fig. 2.—*Cinara atra* (Gillette and Palmer). Fig. 3.—*Cinara caliente* Hottes.

Plate II: Fig. 4.—*Cinara edulis* (Wilson). Fig. 5.—*Cinara metalica* Hottes. Fig. 6.—*Cinara nitidula* Hottes.

Plate III: Fig. 7.—*Cinara pinata* Hottes. Fig. 8.—*Cinara pinona* Hottes. Fig. 9.—*Cinara poketa* Hottes.

Plate IV: Fig. 10.—*Cinara puerca* Hottes. Fig. 11.—*Cinara rustica* Hottes. Fig. 12.—*Cinara tanneri* (Knowlton).

Plate V: Fig. 13.—*Cinara terminalis* (Gillette and Palmer). Fig. 14.—*Cinara wahtolca* Hottes.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

THE RACES OF THE CITRINE CANARY FLYCATCHER,
CULICICAPA HELIANTHEA

BY KENNETH C. PARKES

Carnegie Museum, Pittsburgh, Pa.

The flycatcher genus *Culicicapa* consists of two closely related species, *ceylonensis* and *helianthea*, of somewhat uncertain affinities within the family Muscicapidae (Vaurie, 1953: 532). The gray-headed species *ceylonensis* has a fairly wide distribution in southeast Asia, while *helianthea* is confined to the Philippines and Celebes. The two species are sympatric on the island of Palawan.

The Citrine Canary Flycatcher, *C. helianthea*, is a small bird (wing 53-62 mm), yellow below and greenish above, with a yellow rump-patch and narrow yellow eye-ring. Although it has been collected on at least nine islands of the Philippines, its distribution within that archipelago is spotty, and it is apparently rather uncommon on most of the islands from which it has been recorded. Three subspecies are currently recognized: *C. h. helianthea* (Wallace) from Celebes; *C. h. panayensis* (Sharpe) from the Philippines in general; and *C. h. mayri* Deignan from Tawitawi and Bongao in the Sulu chain. The material I have assembled indicates the presence in this species of geographic variation not adequately expressed by the present division into three subspecies.

Color has been the principal criterion employed in the present study. There is definite variation in size, but there is also sexual dimorphism, males averaging larger than females. The sex ratios within the small available samples of this uncommon species are unbalanced to the extent that comparisons are difficult. Of six specimens from Tawitawi, for example, all are sexed as females, while only one of thirteen from north-

ern Luzón is so sexed. It is therefore possible only to mention apparent trends in size when characterizing the subspecies.

Specimens for this study were borrowed from the American Museum of Natural History, United States National Museum, Academy of Natural Sciences of Philadelphia, and Chicago Natural History Museum. I am indebted to the respective authorities of those institutions; and to Robert W. Storer, who compared selected specimens with the type of *panayensis*, now at the Museum of Zoology, University of Michigan. After this paper had been essentially completed, additional specimens were examined at the Peabody Museum of Natural History, Yale University. With the exception of a single specimen from Mt. Santo Tomás, Luzón, the Yale specimens were neither measured nor listed among the "Specimens Examined" beyond.

A. L. Rand, who had studied this species several years ago, kindly gave me the benefit of a summary of his conclusions, which proved to be almost exactly those I had reached independently.

Culicicapa helianthea helianthea (Wallace)

Muscicapa helianthea Wallace, 1865. Proc. Zool. Soc. London, p. 476 (Menado, Celebes).

Characters: See comparison with other races, beyond.

Range: Celebes.

Specimens examined: Celebes (various localities), 5. A larger series was used for initial comparisons in New York, but these five were taken to Carnegie Museum for detailed comparisons.

Measurements: ♂ wing (flat) 61, 63; tail 51, 51. ♀ wing 58.5, 59, 60; tail 48, 48, 50.

Culicicapa helianthea panayensis (Sharpe)

Xantholestes panayensis Sharpe, 1877. Trans. Linn. Soc. London, 2nd ser., Zoology, 1: 327 (Panay).

Characters: Although this is the subspecies of longest standing, it is the least well differentiated. I have seen no Panay specimens. These comparisons are based on specimens from Negros, Mindanao, and Paláwan, among which there are no appreciable differences in color (Paláwan specimens average slightly larger than the others). Storer's remarks on the type specimen are quoted beyond. This race is close to *helianthea*, but averages slightly richer yellow below, especially on the throat; the yellow rump-patch averages slightly more extensive; the eye-ring is somewhat duller, contrasting less with the sides of the head, which are less intensively yellow than in *helianthea*; averages slightly smaller in size.

The supposed difference between *helianthea* and *panayensis* in bill and foot color mentioned by Peters (1939: 114) is invalid; collectors' notes on labels indicate that both in Celebes and in the Philippines, bills may be either black or sepia, and feet from yellow to dark brown. Material at hand is insufficient to determine whether this variation in soft-part colors may be related to age, sex or season.

A single male from Leyte in the American Museum of Natural History is somewhat less golden yellow, especially on the rump, than any of the series of *panayensis*, and is also slightly smaller than any of the males of that race examined (wing 56, tail 44). More strikingly different from the rest of the series is a single unsexed specimen, now in Carnegie Museum, collected by Bourns and Worcester at Toledo, Cebú, 13 June 1892. It has the rump-patch virtually obsolete (this may in part be an artifact, as some of the feathers of this area may be missing); it is darker, less yellow dorsally, and paler below, especially on the throat and face. It is within the size range of *panayensis* (wing 59.5, tail 49). I have seen no other Cebú specimens, and McGregor (1909: 472) lists only Bourns and Worcester as having collected the species on that island. It is possible that this specimen represents an extinct Cebú endemic subspecies, as Rabor (1959: 40) looked for the species on Cebú in vain.

Storer (letter of 15 April 1960) describes the type of *panayensis* as "a pretty miserable specimen, lacking the tail and most of one wing (other wing 57 mm) and with the feathers of the face matted and useless for comparison . . . [It] is intermediate in back color between the Cebu and Negros birds but nearer the Negros bird. Its throat is more like that of the Cebu bird. My opinion, for what it is worth, is that the difference in the throat could be one of age." In view of the sparsity of material, and of the poor condition of the single Panay and Cebú specimens, it would appear that the best treatment at present would be to use the name *panayensis* for the populations of all of the islands listed below.

Range: Panay, Negros, Mindanao, Paláwan, ?Leyte, ?Cebú. Bourns and Worcester (1894: 41) also list *panayensis* from Tablas, Romblón, Sibuyán, Guimarás, Masbate, and Siquijor, but I have been unable to determine the basis for these supposed records. These islands are not listed by McGregor (*loc. cit.*).

Specimens examined: NEGROS: Lake Balinsasáyao, 4; Cuernos de Negros, 4; Canlaón Volcano, 1; Bais, 1. MINDANAO: Lake Lanao, 4; Ayala, 2; Sumilao, 2; Mt. Apo, 1; Pantar, 1. PALÁWAN: Puerto Princessa, 5; Taguso, 1; Aborlán, 1; unspecified, 1. CEBÚ: Toledo, 1. LEYTE: "Mts. of north Leyte," 1.

Measurements: (Cebú and Leyte specimens omitted; Paláwan measurements italicized): ♂ wing 57, 57, 57, 58, 58.5, 59, 59.5, 60, 60, 60.5, 61.5; tail 45, 47, 47, 47, 47.5, 47.5, 48.5, 49, 49.5, 50, 51, 51.5. ♀ wing 53, 55, 55, 55.5, 56, 56.5, 57.5, 57.5, 58, 58, 58.5, 59, 59; tail 45, 45.5, 46, 46, 47, 47, 47.5, 48, 48, 48.5, 48.5, 50, 50. Type of *panayensis* (measured by R. W. Storer), ♂ wing 57.

Culicicapa helianthea mayri Deignan

Culicicapa helianthea mayri Deignan, 1947. Proc. Biol. Soc. Washington, 60: 61 (Tataán, Tawitawi Island, Sulu Archipelago).

Characters: Less richly yellow than *panayensis* on rump and underparts; paler and grayer on throat; green of crown and back less suffused with golden yellow; cheeks relatively paler, contrasting more with crown; averages smaller than *panayensis*, especially in tail length. This description is based on topotypes from Tawitawi; the two Bongao specimens seen are somewhat larger and generally darker in color. I tentatively follow Deignan in assigning them to *mayri*, but additional material from Bongao might well support separation of an additional subspecies from that tiny island, unlikely as this may seem. There is precedent in the species *Parus elegans*, in which the subspecies *bongaoensis* is remarkably different from the subspecies *suluensis* found on Tawitawi (Parkes, 1958: 105).

Range: Known only from Tawitawi Island in the Sulus; birds from adjacent Bongao Island tentatively placed here.

Specimens examined: TAWITAWI: Tataán, 6. BONGAO, 2.

Measurements: Tawitawi ♀ wing 54.5, 55, 55, 56, 56, 57; tail 42, 44, 44, 44.5, 45, 46 [no males seen]. Bongao ♂ wing 58, tail 48; ♀ wing 59.5, tail 47.

Culicicapa helianthea septentrionalis, new subspecies

Type: U.S.N.M. no. 200638, adult ♂, Mount Santo Tomás (7000 feet), Benguet, Mountain Province, Luzón, Philippine Islands; collected 10 December 1905, by E. A. Mearns (original no. 13810).

Characters: Much less brightly golden yellow below than either *helianthea* or *panayensis*; ventral color deeper than *mayri*; anterior underparts with dusky appearance due at least in part to more extensive and darker gray bases of yellow feathers; lores dark, the color of the crown, rather than yellow as in the southern races; back and crown with less golden yellow wash than *panayensis*, much darker than *mayri*, with a more sharply defined rump-patch; size as in *panayensis*.

Range: Known from two areas in the highlands of the western half of northern Luzón, Philippine Islands.

Specimens examined (all localities on Luzón): Mountain Province (Benguet subprovince): Mt. Santo Tomás, 3; Irisán, 3; Baguio, 1; Haight's-in-the-Oaks, 1; 3 miles above Twin Peaks, 1; "Benguet, 6000 feet," 2. Ilocos Norte Province: Mt. Simminublán (Mt. Sicapo-o), 2.

Measurements: ♂ wing 55, 55.5, 57, 57, 58, 58, 58.5, 59, 60; tail 47, 47, 47.5, 48, 48, 48.5, 48.5, 49, 49. ♀ wing 57, tail 48.

Culicicapa helianthea zimmeri, new subspecies

Type: A.M.N.H. no. 296129, adult ♂, Mount San Cristóbal, Laguna Province, Luzón, Philippine Islands; collected 21 November 1915, by J. T. Zimmer (original no. 1306).

Characters: Similar in dark dorsal color to *septentrionalis*, but rump-patch slightly more golden, less greenish yellow; edges of rectrices deeper, richer yellow than in any other race, having almost an orange cast; the darkest race ventrally, the underparts being a rich, deep yellow, shaded with citrine anteriorly; axillars bright yellow, contrasting sharply with dark sides of breast; smallest of the races in average size.

Range: Known only from the mountains of southeastern Laguna Province, on the Laguna-Tayabas provincial border, south-central Luzón, Philippine Islands.

Specimens examined (all localities on Luzón): Laguna Province: Mt. Banahao, 3; Mt. San Cristóbal, 1. The latter specimen was inadvertently listed by Zimmer (1918: 226) as being from Mt. Banahao, an error of little moment as these two mountains are immediately adjacent to one another.

Measurements: ♂ wing 55, 55, 56; tail 45, 46, 48. ♀ wing 54.5, tail 46.

Remarks: The fame of the late John T. Zimmer as an authority on South American birds has tended to eclipse his contributions to our knowledge of Philippine birds, which remain unknown to many. His collection of meticulously labelled Philippine specimens, now at the American Museum of Natural History, has been of immense help to me in my studies. It is a pleasure for me to name this distinctive subspecies, which he alone appears to have collected, in his memory.

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PROCEEDINGS
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NOTES ON AND A KEY TO SPECIES OF *CINARA*
(FAMILY APHIDAE) WHICH HAVE *ABIES* SP. AS HOST

By F. C. HOTTES

It is a pleasure to acknowledge the assistance of Louis Gentner, Carl Johansen and Joe Schuh who are fortunate to live in a region where *Abies* sp. are abundant, and who have supplied me with much of the material treated in this section.

Cinara abieticola (Cholodkovsky)

Lachnus abieticola L., 1899. Zool. Anz. 22: 470-471, fig. Original description apterous viviparous female.

Lachnus vanduzeei Swain, 1919. A Synopsis of the Aphididae of California, pp. 50-51, fig. Pl. V.

Lachnus piceae (Walker), 1921. Swain Ent. News, 32: 225-227.

C. abieticola (C) Hottes and Essig, 1954. Proc. Biol. Soc. Washington, 67: 95-96, figs. p. 97.

Location of type not known.

Size range apterous viviparous females up to 5.75 mm.

I have seen slide material of this species from Europe and from our Eastern and Western Coasts, but have never taken it alive. It is reported to spend the summers on the roots of *Abies* sp. This species is very close to *C. lasiocarpae* (G & P). It differs from that species in having the hairs on the cornicles contrasting sharply in texture, in having the second tarsal segment shorter and the hairs on the tibiae much longer, and more upstanding.

This species is not confined to one species of *Abies* but has also been taken on *Picea* and *Cedrus*.

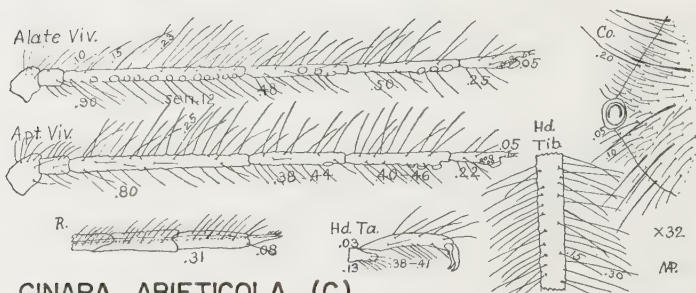
Cinara alacra Hottes and Essig

Cinara alacra Hottes and Essig, 1953. Proc. Biol. Soc. Washington, 66: 205-206, figs. p. 210. Original description apterous viviparous female.

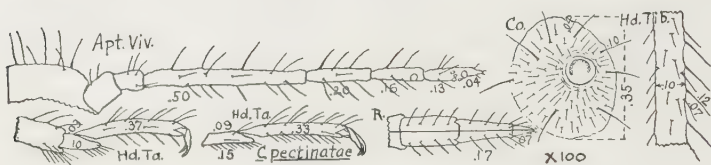
Holotype in collection of E. O. Essig.

Size apterous viviparous female 4.57 mm.

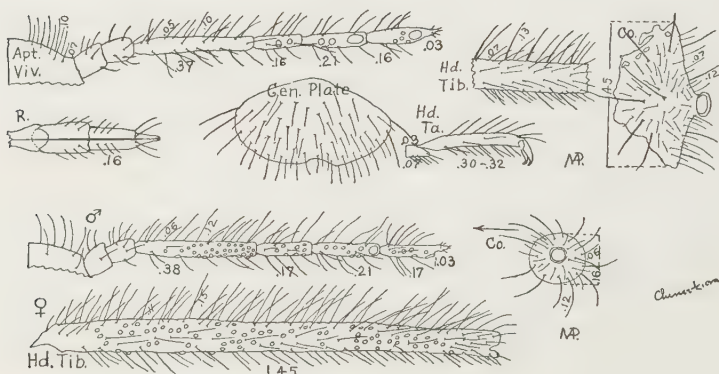
This species is known only from the apterous viviparous female. The features which characterize this species are the cornicles with two types of hair, the coarse spine-like hairs on the tibiae and the numerous coarse



CINARA ABIETICOLA (C.)



CINARA ALACRA H.&E.



CINARA CHINOOKIANA H.

hairs on the dorsum of the abdomen, some of which arise from pigmented areas of various sizes. The type locality of this species is Santa Rosa Mountain, near Paradise, Nevada. Dickson has taken this species on Santa Rosa Peak, San Jacinto Mountains in southern California. So far as known *Abies concolor* is the only host.

Cinara chinookiana Hottes

Cinara chinookiana Hottes, 1955. Proc. Biol. Soc. Washington, 68: 67–69, figs. p. 68. Original description apterous viviparous female.

Hottes, 1957. Proc. Biol. Soc. Washington, 70: 12–13, description apterous male and oviparous female, figs. p. 15.

Holotype and other types in the United States National Museum.

Size range apterous viviparous female 3.29–3.50 mm.

The alate viviparous female of this species has not been taken.

The transverse pigmented spots of this species are very irregular and have tooth-like projections on the margins. The cornicles extend further forward from the orifice than posterior, and the restricted portion is not as dark as the outer margin. The outer hairs on the metathoracic tibiae are much coarser than the hairs on the inner margin, quite upstanding and considerably longer than the width of the tibiae. This species is known from Washington and Oregon. This species is known only from *Abies lasiocarpa*.

Cinara curtihirsuta Hottes and Essig

Cinara curtihirsuta Hottes and Essig, 1954. Proc. Biol. Soc. Washington, 67: 275–276. Original description alate viviparous female.

Hottes, 1957. Proc. Biol. Soc. Washington, 70: 15–16, description apterous viviparous female, figs.

Holotype in collection of E. O. Essig. Morphotype in the collection of the United States National Museum.

Size range apterous viviparous female 3.67 mm.

This species is probably more widely distributed than published records indicate. I have taken it in Oregon and in Arizona, always on *Abies concolor*, the host on which the first material was taken. In life, this species is outstandingly conspicuous; the head is a dull pinkish red and the body gray, slightly pruinose. Arizona specimens were just as conspicuous as the specimens taken in Oregon but were of one color, being a light amber and almost translucent.

Alate specimens have the sensoria on the third antennal segment numbering up to ten. They are arranged in a straight row and are very large. The hairs on the antennae are about .03 mm long in the apterous form and slightly longer in the alate. The metathoracic tibiae have the hairs varying from .03–.04 mm. The hairs on the cornicles are almost confined to the restricted portion of the cornicle.

Specimens of this species feed on the terminal branches among the needles and on the upper portion of the trunks of young trees.

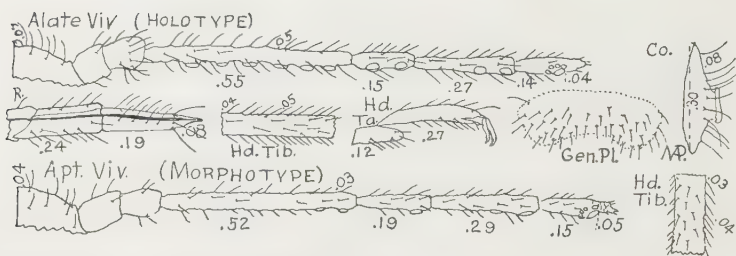
Cinara curvipes (Patch)

Lachnus curvipes (Patch), 1912. Maine Agric. Exper. Sta. Bull., No. 202, pp. 161–163. Original description of all forms; figures. Types in the collection of the Maine Agricultural Experiment Station; so far as known lectotype not indicated.

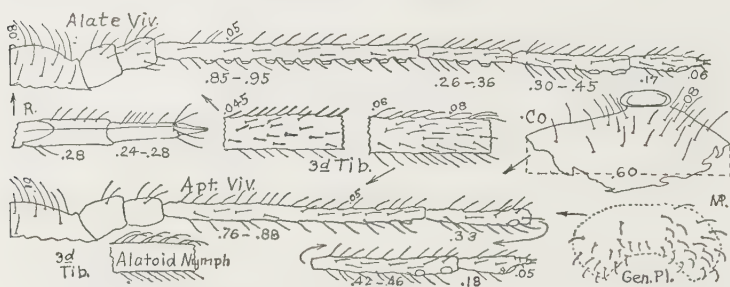
Cinara utahensis Knowlton and Smith, 1938. Ent. News, 49: 66–68, figs. Synonym.

Size range of apterous viviparous females up to .05 mm.

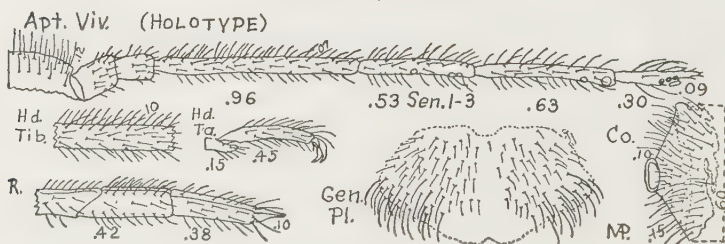
This species is widely distributed in the United States and probably occurs wherever *Abies* sp. grow. I have taken it on *Abies concolor*, *Abies*



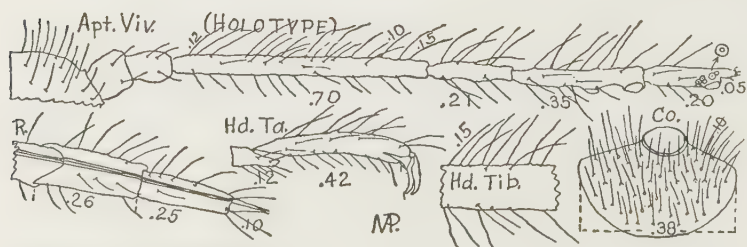
CINARA CURTIHIRSUTA H.&E.



CINARA CURVIPES (P.)



CINARA GENTNERI H.



CINARA GRANDE H.

lasiocarpa, *Abies grandis*. Palmer records it from *Picea engelmanni*, and Essig has taken it on *Cedrus deodora*.

The hairs on the antennal segments and tibiae of this species may differ as to type. Sometimes the hairs on these structures are short and blunt at the end; at other times the hairs are longer with the apical half very fine and drawn out to a fine, droopy point. The hairs on the tibiae, regardless of type, are always shorter than the width of the tibiae. The hairs on the cornicles are confined largely to the restricted portion. Specimens of this species live on the bark of young branches and on the trunks of young trees. The hind tibiae are given to much variation as to length but are always more or less bent, a condition shared by many species of this genus.

Cinara gentneri Hottes

Cinara gentneri Hottes, 1957. Proc. Biol. Soc. Washington, 70: 1-3, figs. p. 8. Original description apterous viviparous and oviparous females.

Holotype and morphotype in the United States National Museum.

Size range apterous viviparous female 5.55-5.77 mm.

The alate viviparous female and the male of this species have yet to be described. The genital plate of this species is the most characteristic feature of this rather large species; it is large and one-half as deep as it is wide; it is provided with numerous hairs.

This species is known only from Oregon and *Abies grandis* is its only known host.

Cinara grande Hottes

Cinara grande Hottes, 1956. Proc. Biol. Soc. Washington, 69: 219-220, figs. p. 223. Original description apterous viviparous female.

Holotype in the United States National Museum.

Size range apterous viviparous females 4.80-5.10 mm.

This species, known from only one collection, has defied repeated efforts to add additional forms to our knowledge. So effectively has it eluded me that I suspect that it migrates to the roots, and that my collecting trips were not correctly timed. Specimens of this species have no pigmented spots on the dorsum of the abdomen. The cornicles have numerous hairs, all of one type. The hairs on the metathoracic tibiae are longer than the width of the tibiae and quite upstanding.

Known from *Abies concolor* on which it was taken from the trunk of a young tree.

Cinara hirta Hottes and Essig

Cinara hirta Hottes and Essig, 1953. Proc. Biol. Soc. Washington, 66: 209-210, figs. p. 210. Original description apterous viviparous female.

Holotype in collection of E. O. Essig.

Size range apterous viviparous females 3.43-4.00 mm.

Despite repeated efforts to collect additional forms of this species, it

is known only from the apterous viviparous form. I have taken this species on *Abies concolor* in the Santa Catalina Mountains near Tucson. They were located on the twigs among the needles and were taken solitary. The specimens were a light uniform buff. The body hairs of this species are very abundant, so that the body appears to be covered with fur, the hairs overlapping one another. At the apex the hairs suggest the apex of a nail. The anterior and posterior margins of the cornicles lie within the lateral pigmented areas, so that the extent of the cornicles in these directions is difficult to determine.

Cinara kiusa Hottes

Cinara kiusa Hottes, 1957. Proc. Biol. Soc. Washington, 70: 3-4, figs. p. 8. Original description apterous viviparous female.

Holotype in the United States National Museum.

Range in size apterous viviparous females 3.25-3.67 mm.

This species is known only from the original collection of apterous viviparous females, taken at Bly, Oregon, on *Abies concolor*. The antennal segments of this species have numerous rather short, fine hairs for the most part not longer, or but little longer, than the width of third segment. The unguis is finger-like. The hairs on the tibiae are numerous, fine and shorter than the width of tibiae.

To locate *Abies concolor* near Bly one must continue on the highway east of Bly for ten or twelve miles and turn left on a forestry road, just as the highway turns downhill to the right. This area has given us four little known species of *Cinara*.

Cinara lasiocarpae (Gillette and Palmer)

Lachnus lasiocarpae Gillette and Palmer, 1930. Ann. Ent. Soc. America, 23: 543-544, figs. pp. 550-551. Original description apterous viviparous female.

C. lasiocarpae (Gillette and Palmer), Hottes, 1954. Proc. Biol. Soc. Washington, 67: 259-260. Description alate viviparous female.

C. lasiocarpae (Gillette and Palmer), Hottes, 1955. Proc. Biol. Soc. Washington, 68: 73-75, fig. p. 68. Description alate male.

Type in the United States National Museum.

Size range apterous viviparous female 4.00-5.00 mm.

This species so far as known is confined to *Abies lasiocarpa*. It seems to be confined to the Rocky Mountain region. It is closely allied to *C. abieticola* (Cholodkovsky) and differs from that species in having shorter hairs on the tibiae which are also less upstanding, shorter second tarsal segments, and the two types of hairs on the cornicles less strongly differentiated.

Specimens of this species are to be found on the trunks of small trees in the spring and fall, perhaps they migrate to the roots in the summer.

Cinara occidentalis (Davidson)

Lachnus occidentalis Davidson, 1909. Jour. Econ. Ent., 2: 300. Original description apterous viviparous female.

Lachnus occidentalis Davidson, Wilson, 1912. The Canadian Ent., 44: 193–194. Description of all forms.

Lachnus occidentalis Davidson, Palmer, 1926. Ann. Ent. Soc. America, 19: 308–311. Life history and description and figures of all forms.

Palmer lists the type as possibly in the United States National Museum. Size range 2.5–3 mm.

The long, numerous upstanding hairs on the comparatively short tibiae, and the long second tarsal segments distinguish this species.

I have seen material of this species from California and Washington, and have taken it in Colorado, Arizona, Nevada and Oregon. Specimens of this species live in small colonies at the ends of twigs. Specimens are quite flocculent, so that the colonies present a distinctly bluish white appearance. The flocculent material holds small globules of honey dew.

Cinara osborni Knowlton

Cinara osborni Knowlton, 1942. Great Basin Nat., 3: 7, figs. p. 6. Original description apterous viviparous female.

Cinara alticola Hottes and Essig, 1953. Proc. Biol. Soc. Washington, 66: 151–152, figs. p. 154.

Type in Knowlton collection.

Size range of apterous viviparous females 3.5–4.00 mm.

Only the apterous viviparous female of this form is known. It is allied to *C. hirta* and differs from that species in the hairs on the dorsum of the abdomen being longer and tapering to a sharp point. The hairs on the abdomen are less numerous than in *hirta*.

I have taken this species in Arizona and Nevada, and have seen specimens from California. I have taken it on both *Abies concolor*, a new host, and *Abies lasiocarpa*. It varies considerably in color but is never a pale tan. In the region of the Grand Canyon the thorax has four black spots and the abdomen is gray, lightly covered with pruinose. Specimens of this species live solitary on the twigs.

Cinara pacifica (Wilson)

Lachniella pacifica Wilson, 1919. The Canadian Ent., 51: 21. Original description of alate viviparous female.

Cinara pacifica (Wilson), Palmer, 1945. Ann. Ent. Soc. America, 38: 451. Description and figs.

Type possibly in the United States National Museum.

Size range alate viviparous females given by Palmer as 1.86 (?).

This species is known only from the original material taken by A. D. Hopkins and Theo. Pergande in 1903 at Eureka, California. I looked for this species in northern California in 1958, and made a special trip

to Eureka which must have changed greatly since 1903. I would expect the apterous viviparous females to have cornicles and hairs quite similar to those of the alate form and have keyed the species on the character of the unique cornicles.

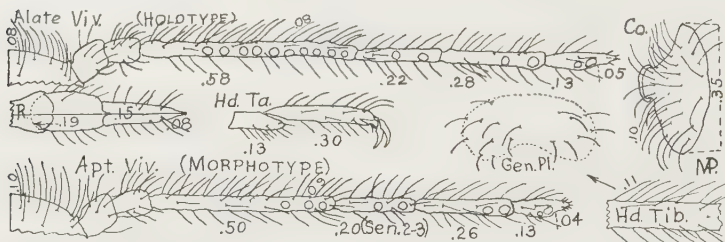
Cinara schuhi Hottes

Cinara schuhi Hottes, 1957. Proc. Biol. Soc. Washington, 70: 4-6, figs. p. 8. Original description alate and apterous viviparous females.

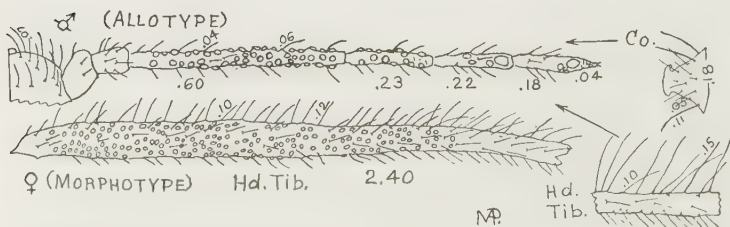
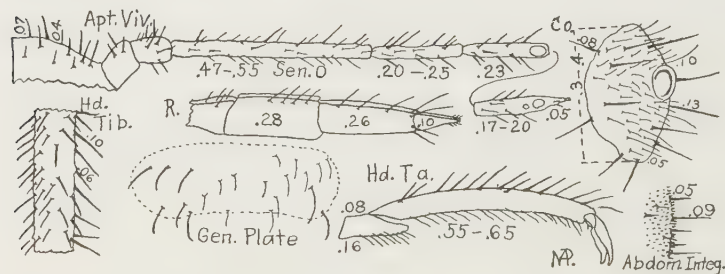
Holotype and morphotype in the United States National Museum.

Size range apterous viviparous females 2.55-2.85 mm.

No species now known from *Abies concolor* has the hair on the tibiae similar to the hairs on the tibiae of this species. Apterous viviparous females may have up to five large round sensoria arranged in a straight row, more than any other species on this host.



CINARA SCHUHI H.



CINARA SETULOSA H.&E.

Cinara setulosa Hottes and Essig

Cinara setulosa Hottes and Essig, 1955. Proc. Biol. Soc. Washington, 68: 61-62. Original description apterous viviparous female.

Hottes, 1955. Proc. Biol. Soc. Washington, 68: 70, figs.

Hottes, 1957. Proc. Biol. Soc. Washington, 70: 11-12, figs. p. 16. Description of alate male and oviparous female.

Holotype in collection of E. O. Essig.

Size range 4.50-5.00 mm.

The extremely well-developed setulae on the dorsum of the abdomen separate this species at once from other species which have two types of hairs on the cornicles.

Cinara sonata Hottes

Cinara sonata Hottes, 1955. Proc. Biol. Soc. Washington, 68: 202-203, figs. p. 200. Original description apterous viviparous female.

Hottes, 1957. Proc. Biol. Soc. Washington, 70: 9-11, figs. p. 16. Description alate viviparous female and apterous oviparous female.

Holotype and morphotypes in the United States National Museum.



CINARA SONATA H.

Size range 5.27–7.00 mm.

The cornicles of this species have a deep notch on the outer margin. This feature separates it at once from its closely related species *C. abieticola*.

A KEY TO APTEROUS VIVIPAROUS FEMALES OF THE GENUS *CINARA*
(FAMILY APHIDAE) WHICH HAVE *ABIES* SP. FOR HOST

1. Cornicles with a diameter of less than .25 mm 2
 Cornicles with a diameter of more than .30 mm 4
2. Cornicles with a diameter of .10 mm *C. pacifica* (Wilson)
 Cornicles with a diameter of about .20 mm 3
3. Hair on metathoracic tibiae shorter than width of segment;
 second metatarsal segment about one-fifth the length of hind
 tibiae *C. minuta* Hottes and Knowlton
 Hair on metathoracic tibiae longer than width of segment;
 second metatarsal segment about one-third length of hind
 tibiae *C. occidentalis* (Davidson)
4. Cornicles provided with coarse and fine hairs 5
 Cornicles with only one type of hair 12
5. Dorsum of abdomen with well-developed setulae, transverse
 pigmented spot not divided or only partially so
 *C. setulosa* Hottes and Essig
 Dorsum of abdomen without or with poorly developed setulae,
 transverse pigmented spot divided 6
6. Hairs on metathoracic tibiae shorter than or about equal to width
 of tibiae 7
 Hairs on metathoracic tibiae longer than width of tibiae 9
7. Cornicles incorporated within lateral pigmented areas 8
 Cornicles not incorporated within lateral pigmented areas
 *C. alacra* Hottes and Essig
8. Hairs on dorsum of abdomen with apex similar to apex of a nail,
 not tapering to a sharp point *C. hirta* Hottes and Essig
 Hairs on dorsum of abdomen tapering to a sharp point
 *C. osborni* Knowlton
9. Size not much over 3.5 mm *C. chinookiana* Hottes
 Size 4.00–7.00 mm 10
10. Cornicles with deep notch *C. sonata* Hottes
 Cornicles without notch 11
11. Second tarsal segment .42–.50 mm; hairs on hind tibiae .12–.17
 mm upstanding but not nearly at right angles; hairs on cornicles
 not sharply differentiated as to two types
 *C. lasiocarpae* Gillette and Palmer
 Second tarsal segment .38–.41 mm; hairs on hind tibiae .15–.30
 mm almost at right angles; hairs on cornicles distinctly of two
 types *C. abieticola* (Cholodkovsky)
12. Metathoracic tibiae with blunt hairs *C. curvipes* (Patch)
 Metathoracic tibiae with sharp pointed hairs 13



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NEW SYNONYMIES AND GENERIC CHANGES IN THE
LYGAEIDAE (HEMIPTERA-HETEROPTERA)

By PETER D. ASHLOCK

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The following changes are published now so that they may be used in forthcoming publications in which nomenclatorial changes seem out of place, and so that they may be incorporated in a world catalogue of the Lygaeidae now in preparation by James A. Slater.

Kleidocerys virescens (Fabricius), new combination

Acanthia virescens Fabricius, 1794, Ent. Syst., 4:70.

Tingis (?) *virescens* (Fabr.), Fabricius, 1803, Syst. Rhyng., p. 127.

Ischnorhynchus championi Distant, 1882, Biol. Cent. Amer., Ins., Hemip.-Heterop., 1:193, Pl. 19, Fig. 3, new synonymy.

Kleidocerys championi (Dist.), Barber, 1947, Mem. Soc. Cubana Hist. Nat., 19:64; Barber, 1953, Proc. Ent. Soc. Washington, 55: 281.

Remarks: For nearly a century, authors, following Stål, have been treating *virescens* as a member of the Cymini, either in the genus *Cymodema* or in the genus *Cymus* (see synonymy of *Cymus breviceps* Stål below). Through the courtesy of S. L. Tuxen and C. J. Drake, I have examined the type of the species and find that it is the same as the species described by Distant as *Ischnorhynchus championi*.

Fabricius' description mentions the presence of two spots close together in the middle of the hemelytra and three spots on its posterior margin, while Stål's redescription has a note appended remarking on their absence. Spots in these positions are present in the Fabrician type I have seen, and are a common occurrence in species of *Kleidocerys*, but are present in no member of the Cymini. Apparently Stål did not have the type specimen of *virescens* before him when he redescribed the species.

When Tuxen sent a number of Fabrician types to Drake, he assured him that they were the true Fabrician specimens. The specimen here discussed is in fairly good condition, but has been pinned through the thorax with a rather large pin, and it lacks both antennae. There is

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a single label on the pin upon which is handwritten "virescens" on the upper surface, and "n. sp." on the lower surface. The first "s" on the upper surface and the "s" on the lower surface are of the old f-style. I have selected this specimen as lectotype, and have added to the specimen a label so stating.

Cymus breviceps Stål

Cymodema virescens (Fabr.), Stål, 1868, Svenska Vet.-Akad. Handl. (Hemip. Fabr. 1.), 7(11): 77, misidentification.

Cymus virescens (Fabr.), Stål, 1874, Svenska Vet.-Akad. Handl. (Enum. Hemip. 4.), 12(1):127, misidentification; Barber, 1923, Amer. Mus. Nov., 75:12, misidentification, makes *breviceps* Stål a synonym.

Cymus breviceps Stål, 1874, Svenska Vet.-Akad. Handl. (Enum. Hemip. 4.), 12(1):127; Van Duzee, 1909, Canadian Ent., 41:372, makes *exiguum* Horváth a synonym.

Cymodema exiguum Horváth, 1908, Ann. Mus. Nat. Hungarici, 6:559.

Remarks: Since *virescens* Fabr. has been found to belong to the genus *Kleidocerys*, another name must be found for *Cymus virescens* of authors, not Fabricius. Oddly enough, Stål himself described the species in his Enumeratio Hemipterorum as *Cymus breviceps*, and apparently did not recognize that it was the same as the one he redescribed as *Cymodema virescens* (Fabr.). Since *virescens* was originally described from the West Indies ("Americae meridionalis insulis") and *breviceps* from Texas and Carolina, possibly it did not occur to Stål that his two descriptions applied to the same species. *Cymodema exiguum* Horváth, described from Washington, D. C., is a later synonym. I have reviewed the specimens under the name *Cymus virescens* in the U. S. National Museum collection and can find no differences between West Indian specimens and those from continental North America. Therefore *Cymus breviceps* Stål becomes the correct name for the taxon *Cymus virescens* of authors, not Fabricius, and all references to *virescens* other than the two Fabrician ones should be transferred to *breviceps* Stål.

Ligyrocoris insititia (Distant), new combination

Erlacda (?) *insititia* Distant, 1893, Biol. Cent. Amer., Ins., Rhynch., Hemip.-Heterop., 1(suppl.):401, Pl. 35, Fig. 8.

Remarks: R. J. Izzard of the British Museum (Natural History) kindly confirmed my identification of this species. Since there is a stridulatory area, or "semi-lunate strigose vitta," on each side of the two basal abdominal segments, the species must be transferred to the genus *Ligyrocoris* Stål. It is most closely related to *L. nitidicollis* (Stål), though it is considerably larger.

Delochilocoris Bergroth

Dorachosa Distant, 1893, Biol. Cent. Amer., Ins., Rhynch., Hemip.-Heterop., 1(suppl.):409, preoccupied, Distant, 1892, Cicadidae.

Delochilocoris Bergroth, 1893, Rev. d'Ent., 12:154, new name for *Dorachosa* Distant, 1893.

Remarks: American authors have generally placed the North American species *D. illuminatus* Distant and *D. umbrosus* Distant in the old world genus *Aphanus* of authors, not Laporte, following Horváth, 1908 (Ann. Mus. Hungarici, 6:561) and Barber, 1919 (Jour. New York Ent. Soc., 26:61). China, 1943 (Generic Names of British Insects, Part 8, p. 242), however, pointed out that *Rhyparochromus* Hahn, 1826, must be used in place of *Aphanus* of authors, not Laporte, and American authors have followed this arrangement ever since.

In 1957 Scudder (Ent. Mon. Mag., 93:152-6) reclassified the subfamily Rhyparochrominae (now Megalonotinae, see Slater, 1957, Bull. Brooklyn Ent. Soc., 52:35-8) and placed *Rhyparochromus* Hahn in the subtribe Rhyparochromina (Megalonotina). The subtribe was characterized, among other characters, by the dorsal location of abdominal spiracles III and IV. I have examined the spiracles of *D. umbrosus* and find that only the spiracles of segment IV are dorsal; consequently, the species must belong to the subtribe Gonianotina, *sensu* Scudder. Therefore the North American species described by Distant cannot be placed in the old world genus *Rhyparochromus* Hahn, and Bergroth's *Delochilocoris* must be resurrected for the two American species.

Delochilocoris is very closely related to *Malezonotus* Barber. The most obvious difference is that the species of *Delochilocoris* have entirely black hemelytra while those of *Malezonotus* species are patterned. In addition, the species of *Delochilocoris* are subshining and nearly glabrous, even on the head, while those of *Malezonotus* are all dull, and have rather long pilosity on the body surface, or at least on the head, as in *M. angustatus* (Van Duzee).

Balboa Distant

Balboa Distant, 1893, Biol. Cent. Amer., Ins., Rhynch., Hemip.-Heterop., 1(suppl.):408, Pl. 35, Fig. 25.

Remarks: In 1918 Barber (Jour. New York Ent. Soc., 26:53) suggested that *Balboa* Distant might be a synonym of *Ozophora* Uhler, and in another paper in the same year (Psyche, 25:80) he included *Balboa* in his treatment of *Ozophora*. The monobasic type of the genus *Balboa*, *variabilis* Distant, differs from species of *Ozophora* in its foliaceously expanded rather than carinate, pronotal margins. Also unlike species of *Ozophora*, it possesses a stridulatory apparatus consisting of a striated coastal margin of the hemelytra and a plectrum on the hind femora. These characters would seem sufficient to establish *Balboa* as a valid genus. *Ozophora ampliata* Barber was found to be congeneric with *B. variabilis* and so is transferred to the genus *Balboa*. *Balboa ampliata* (Barber) is the new combination.

Prosomoeus brunneus Scott

Prosomoeus brunneus Scott, 1874, Ann. Mag. Nat. Hist. (4), 14:435-7.
Ligyrocoris terminalis Uhler, 1896, Proc. U. S. Nat. Mus., 19:262-3,
new synonymy.

Izzard has checked a paratype of Uhler's species against the type of Scott's and pronounced them the same. Hence, *Ligyrocoris terminalis* Uhler must be regarded as a synonym of *Prosomoeus brunneus* Scott. Both were described from Japan.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

FIVE NEW WESTERN GEOPHILID CHILOPODS

BY RALPH V. CHAMBERLIN

University of Utah

The types of the new geophilid chilopods diagnosed in the present paper are for the present retained in the author's extensive collection of chilopods from the western United States at the University of Utah.

DIGNATHODONTIDAE

Damothus new genus

Body narrowed both cephalad and caudad. Head small, lacking a frontal suture. Antennae short. Labrum with median piece very large as in *Linotaenia*, its free margin dentate throughout. First maxillae without lappets.

Prehensors lacking sclerotic lines; the claws when closed not attaining the anterior margin of the head; claws each armed at base with two stout teeth or serratures.

Ventral pores absent.

Last ventral plate wide. Coxal pores partly covered by this plate, few in number.

Anal pores present.

Telopodite of anal legs composed of six articles; claw normally developed.

Type species: Damothus montis new species.

Most readily distinguished from *Linotaenia* in having at the base of each claw of the prehensors two stout teeth in place of the single one present in the latter genus.

Damothus montis new species

Median piece of labrum very large, its free margin bearing close-set conical teeth throughout its length. First maxillae with the palpus large and biarticulate. Claws of the second maxillae large and smooth.

Prehensors small; claws slender, when closed not attaining front margin of head. Each tooth at base of claw accompanied by a stout seta in line with similar setae on the preceding articles.

Sternites lacking pores; clothed over entire surface with evenly spaced erect setae.

Last ventral plate trapeziform. Coxal pores in the holotype numbering five on each side, these mostly covered by the sternite.

Anal pores present, small.

Legs in the male evenly crassate, the articles between coxa and second tarsal nearly cylindrical in form; clothed throughout with long setae; ending in a well-developed claw.

Pairs of legs: 37 (39).

Length: 12 mm.

Locality: UTAH: Wahsatch Mountains at Brighton. Type taken 19 November 1939.

***Zantaenia* new genus**

Body in general form like that of typical *Linotaenia*, with head proportionately small.

Head with frontal suture distinct. The median piece of the labrum bearing distinct serratures or teeth on its free margin, its ends resting directly on the fulcra, apparently with no intervening lateral pieces. Palpi of first maxillae biarticulate.

Prehensors lacking evident sclerotic lines; claws slender, neither they nor other articles with teeth.

Tergites not sulcate; last intertergite separated from the pleurite on each side by a distinct suture.

Last ventral plate narrow. Coxal pores on each side small and numerous, distributed over most of the surface.

Anal pores present.

Anal legs with claw present in the female but lacking in the male.

Type species: *Zantaenia idahona* new species.

Differing from *Agathothus*, which it resembles in the form of the prehensors, in having the free margin of the labrum bearing large serratures and teeth in place of a fringe of setae and in having the last ventral plate narrow and the coxal pores numerous and found over the entire surface instead of having this plate broad with the coxal pores few and aggregated near the margin of the sternite.

***Zantaenia idahona* new species**

Clypeus with a transverse series of four stout setae such as usual in *Linotaenia*. Middle piece of labrum very wide with its ends abutting directly on the fulcra; median piece with large serratures laterally and dentiform processes over the middle portion, these close-set. First maxillae and their palpi, large, distally pointed, and biarticulate. Claws of second maxillae small, much surpassed in length by the adjacent setae which form a dense brush on the terminal article; fewer setae on the penult article; coxae fully coalesced.

Tergites smooth and glabrous, not sulcate. Last intertergite separated from the pleurites.

Spiracles all round, the first scarcely larger than the second.

Sternites with a median longitudinal sulcus which is widened and deepened at its middle.

Last ventral plate narrow and elongate, its sides converging caudad. Coxal pores small and numerous, opening over entire surface.

Anal pores large.

Last legs not exceeding the penult in length; claw present in female but absent in male.

Pairs of legs: 51 (♂), 55 (♀).

Length: 45 mm.

Locality: IDAHO: Wallace, 3 September 1949. S. Mulaik, collector.

PACHYMERINIDAE

Pachymerium idium new species

Two clypeal areas present but these not sharply defined in that their component polygonal units grade into the ordinary ones at their periphery, the two areas contiguous at middle line; a stout seta at middle of each area, with two setae in front of the combined areas and a transverse series of 3 or 4 setae on each side of them; farther back on clypeus another transverse series of setae.

Lateral pieces of labrum extending in front of middle piece but not meeting at middle; middle piece bearing a series of teeth, the lateral pieces bearing setae or pectinate. A large, distally acuminate lappet arising from coxosternum on each side.

Prehensors stout; the prosternum relatively long, without sclerotic lines; claws when closed much surpassing the anterior margin of head; unarmed with teeth.

Spiracles all circular. Sternites with no pores evident.

Last sternite very wide, trapeziform, its sides convex and the caudal margin moderately incurved. Coxal pores four on each side.

Anal pores large.

Anal legs not exceeding the penult in length, not specially thickened, bearing a well-developed claw.

Pairs of legs: 65.

Length: 25 mm.

Locality: CALIFORNIA: Marin Co., 1½ mi north of Dillon Beach.

The single type was taken 26 July 1960, "in the upper zone in a fissure in rock" kept moist by spray but not covered at high tide. The specimen was kindly transmitted by J. W. Hedgpeth, Director of the Pacific Marine Station.

SCHENDYLIDAE

Gosendyla new genus

Labrum in form of an obtuse, apically somewhat rounded reentrant angle, the middle portion bearing a series of numerous stout conical teeth. First maxillae without lappets. Coxae of second maxillae united at middle and without median sulcus; claw of palpus closely pectinate on both margins.

Ventral pores absent.

Coxal pores small and numerous.

Anal pores present.

Type species: Gosendyla socarnia new species.

Close to the Guatemalan *Sogolabis* in the presence of anal pores and the numerous coxal pores, but differing in having the claws of the second maxillae bipectinate instead of smooth.

***Gosendyla socarnia* new species**

Head as wide as long, the sides convex, the anterior margin obtusely rounded and the caudal margin weakly convex. Antennae long, with the terminal article as long as, or a little longer than, the two preceding articles taken together.

Labrum forming an obtuse reentrant angle with the deeper middle portion strongly armed with teeth which in middle portion are conical but laterally become distally rounded and somewhat creniform; beyond the dentate series on each side the labral margin wholly smooth. Coxae of second maxillae broadly united at middle but anteriorly showing a pale median line; anterior margin of coxosternum showing a small reentrant angle at middle; claw of palpus long, closely pectinate on both margins.

Prehensors with claw and other parts wholly unarmed; claws when closed attaining anterior margin of head; no sclerotic lines evident.

Sternites with a median longitudinal sulcus; with no pores.

Last ventral plate somewhat shield-shaped, caudally widely rounded. Coxopleurae inflated making the last pediferous segment notably wider transversely than the preceding segment or two; pores small and numerous, subseriately arranged.

Anal pores present.

Last legs with telopodite six-jointed; in male strongly inflated; claw absent; clothed throughout with very short setae.

Pairs of legs: 49.

Length: 20 mm.

Locality: UTAH: Dry Canyon, near University of Utah campus.

***Zygona* new genus**

Labrum nearly straight transversely, but noticeably incurved at middle; median portion dentate; lateral margins smooth. First maxillae with a specialized, distally somewhat fimbriate lappet from coxosternum on each side. Second maxilla with claw of palpus well developed and smooth.

Prehensors with prosternum and other articles lacking teeth; claws when closed surpassing anterior margin of head.

Tergites bisulcate.

Last sternite broad. Coxal glands composite, opening through two pores on each side.

Anal pores present.

Anal legs with telopodite composed of six articles; claw well developed.

Type species: Zygonia duplex new species.

Distinguished especially by the composite coxal glands.

***Zygonia duplex* new species**

Body with dorsum showing a dark geminate stripe, this more distinct posteriorly than anteriorly.

Head much longer than wide (17:11). Antennae long, the last article much shorter than the two preceding taken together.

Prebasal plate exposed.

Clypeus bearing numerous well-spaced setae over entire surface. Labrum over middle portion bearing a nearly straight series of stout teeth, the lateral margins smooth. First maxillae with coxae fused; palpus thick, biarticulate, the terminal article rounded and bearing long setae, with similar setae at distal end of penult article; at base of palpus arising from coxa a peculiar lappet bearing at distal end a series of setae directed mesad, fimbriate. Second maxillae with claws entirely smooth; all joints bearing numerous long setae, the second bearing on its outer side toward distal end a stout spine.

Tergites smooth, bisulcate. Sternites with a median longitudinal sulcus, lacking pores. Spiracles all circular, the first scarcely enlarged.

Last ventral plate broadly trapeziform. Coxal glands composite, the simple glands aggregated into two groups and opening through two pores on each side.

Anal pores present.

Anal legs longer and thicker than the penult but not crassate.

Pairs of legs: 53.

Length: 33 mm.

Locality: ARIZONA: Santa Rita Mountains, Madison Canyon. Holotype taken 10 September 1941.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

XYRIDACEAE FROM BRAZIL—II¹

By LYMAN B. SMITH AND ROBERT J. DOWNS

*U. S. National Museum, Smithsonian Institution, and
U. S. Department of Agriculture*

Since our first paper in this series we have begun preparation of a comprehensive study of all the Xyridaceae of Brazil, but as completion is still distant it seems well to record certain novelties and discoveries now. Noting the strongly contrasting specific characters of the epidermis shown in a few cases by Malme in his monographic work,² we have made a concerted effort to examine and illustrate sections wherever possible. In assessing the value of cellular characters we have been greatly aided by Sherwin Carlquist, whose generic studies in the Xyridaceae³ are a model which we would sometime like to attain. Abbreviations for herbaria are those of the fourth edition of the "Index Herbariorum," of Lanjouw and Stafleu.

Xyris (*Xyris*) *brevifolia* Michx. Fl. Bor. Am. 1:23. 1803; Malme, Arkiv Bot. 22A, no. 15:3. 1929.

Rio de Janeiro: Without further locality, St-Hilaire Catal. B² no. 121 (P). Pontal Beach, Araial do Cabo, Município de Cabo Frio, 3 June 1953, F. Segadas Vianna et al, no. Restinga—I 440 (R, US).

Malme indicated that he was quite dubious that this native species of southeastern United States could also be native in Brazil, and with the information then available his was a logical conclusion. However, with the discovery of new material it appears more likely that the species is native in Brazil, because Cabo Frio is remote from the centers where introductions would be likely. Also such parallel cases as *Arenaria*

¹ The present study was based in part on material collected by the senior author under a grant from the National Science Foundation. Number one of this series was in the Jour. Washington Acad. Sci., 44(10): 311-313, 1 fig. October 1954.

² Malme, G. O. A:N. *Xyris* L., Untergattung *Nematopus* (Seubert). Entwurf einer Gliederung. Arkiv Bot. 13(3): 1-103, Figs. 1-5. 19 August 1913.

³ Carlquist, Sherwin. Anatomy of Guayana Xyridaceae: *Abolboda*, *Orectanthe*, and *Achlyphila*. Mem. New York Bot. Gard. 10(2): 65-117, Figs. 1-129. 30 April 1960.

groenlandica (Retz) Spreng.,⁴ *Hypericum gentianoides* (L.) B.S.P.,⁵ and *Proserpinaca palustris* L.⁶ add strength to the belief that this is a natural pre-Columbian distribution. Saint-Hilaire gave no locality, but he was at Cabo Frio; thus the two collections, although separated by more than a century, may be from the same locality.

***Xyris* (*Nematopus*) *archeri* Smith and Downs, new species**

Fig. 1

Caespitosa, subcaulescens sed bulbosa; rhizomate brevi; radicibus tenuibus; foliis manifeste distichis, ad 10 cm longis, ensiformi-linearibus, glabris vel margine minutissime ciliatis; vaginis ca. 25 mm longis, minutissime rugosis, hyalino-marginatis, superne quam laminis paulo angustioribus, apice ligula acuta aucta, basi dilatatis et atro-castaneis, laevibus; laminis ad 1.5 mm latis, apice asymmetricè acutis, nervatis, nervis submarginalibus incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus in sectione transversa suborbicularibus, 20–25 μ diametro, parietibus exterioribus 3–10 μ crassis, alteris distincte tenuioribus, cellularum parte intima persistente; scapis terminalibus et lateralibus, vix distincte tortis, gracillimis, 16–31 cm altis, teretibus, laevibus vel obscure costatis; vagina scaporum distincte laminata, quam foliis paulo brevior; spica ovoidea vel ellipsoidea dein floribus patentibus subglobosa, 8–9 mm longa, ca. 10-flora; bracteis arcte imbricatis, infimis valde reductis, obovatis, uninerviis, florigeris late ellipticis, apice late rotundatis cuspidatisque, quam sepalis paulo brevioribus, integris, late convexis, glabris, opacis, minute rugosis, atro-brunneis, area dorsali carentibus; sepalis lateralibus ca. $\frac{1}{2}$ connatis, inaequaliteralibus, lanceolatis, acutis, 6 mm longis, carina basi glabra, alibi dense ferrugineo-pilosa; limbo petalorum obovato, 4.5 mm longo; antheris oblongis, 1.5–2 mm longis; staminodiis penicillatis; ovario ellipsoideo; placentis basalibus; seminibus obovoideis, apiculatis.

Type in the U. S. National Herbarium, No. 2,121,775, collected in campo, Serra do Cipó at kilometer 119, Município de Santa Luzia, State of Minas Gerais, Brazil, 6 August 1936, by W. A. Archer and Mello Barreto (No. 4977).

Paratype: BRAZIL: Minas Gerais: Município Conceição: Campo, Estrada de Conceição, 7 August 1933, Mello Barreto 4353 (US).

In its general habit, *Xyris archeri* appears to be a very slender variety of *X. obtusiuscula* Alb. Nilsson, and it also resembles it in its floral bracts and connate sepals. However, the essentially eciliate leaves and exerted sepals distinguish *X. archeri* sufficiently to warrant specific designation.

⁴ Smith, L. B., and Downs, R. J. Resumo preliminar das Cariofiláceas de Santa Catarina. *Sellowia*, No. 12: 123. 1960.

⁵ Smith, L. B. Notes on South American Phanerogams—II. *Jour. Washington Acad. Sci.* 48: 313. 1958.

⁶ Reitz, P. R. As Halorrhagaceae de Santa Catarina. *Sellowia*, No. 6: 239. 1954.

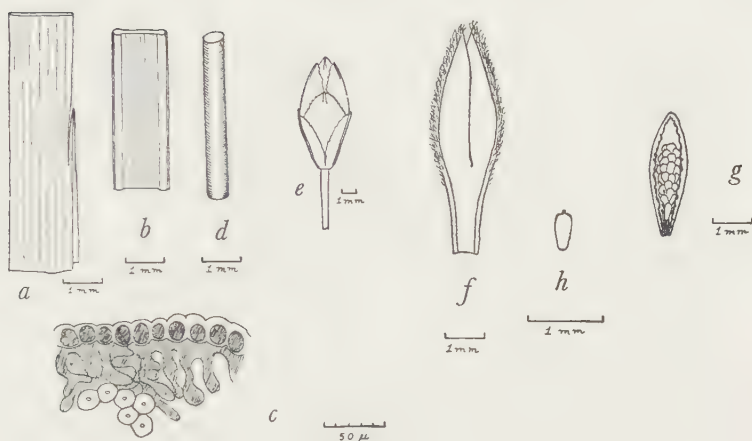


FIG. 1

***Xyris (Nematopus?) egleri* Smith and Downs, new species**

Fig. 2

Caespitosa, acaulis; radicibus tenuibus; foliis spiraliter ordinatis, vix manifeste distichis, ensiformi-linearibus, ad 16 cm longis, omnino glabris; vaginis ca. tertiam partem folii occupantibus, superne quam laminis haud latioribus, eligulatis, basi paulo dilatatis et haud vel vix atrioribus; laminis ad 4 mm latis, apice asymmetric lateque acutis, viridibus, ex sicco plus minusve nervatis, nervis submarginalibus incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus in sectione transversa fere aequalibus sed marginalibus paulo prominentibus, subquadratis, 50–60 μ altis, parietibus exterioribus 5–10 μ crassis, alteris multo tenuioribus, cellularum parte intima persistente; scapis terminalibus, spiraliter tortis, ad 56 cm altis, superne bialatis, 2–2.5 mm latis, minutissime punctulatis; vagina scaporum folias subaequante, in apiculum foliaceum excurrente, viridi; spica permultiflora, semiglobosa, 12–14 mm diametro; bracteis patentibus, basilaribus inflorescentiam involucrentibus, duabus infimis linearibus, reliquis aequantibus vel paulo superantibus, fertilibus anguste obovatis, acutis, apice carinatis et late tenuiterque brunneo-marginatis, sepala multo superantibus, area dorsali carentibus, glabris; sepalis lateralibus liberis, subaequilateris, ellipticis, obtusis, basi attenuatis, ala carinali angusta, ad apicem versus minute ciliata; limbo petalorum obovato, 3 mm longo; antheris oblongis, ca. 1 mm longis; staminodiis bibrachiatis, penicillatis; in ovaris perjuvenilibus placentis haud exacte visis.

Type in the U. S. National Herbarium, No. 2,283,916, collected in swampy campo, Missão Velha, Rio Cururú, Alto Tapajós, State of Pará, Brazil, 19 July 1959, by W. A. Egler (No. 953) and Raimundo. Isotype in the Museu Paraense "Emílio Goeldi" (No. 23.766).

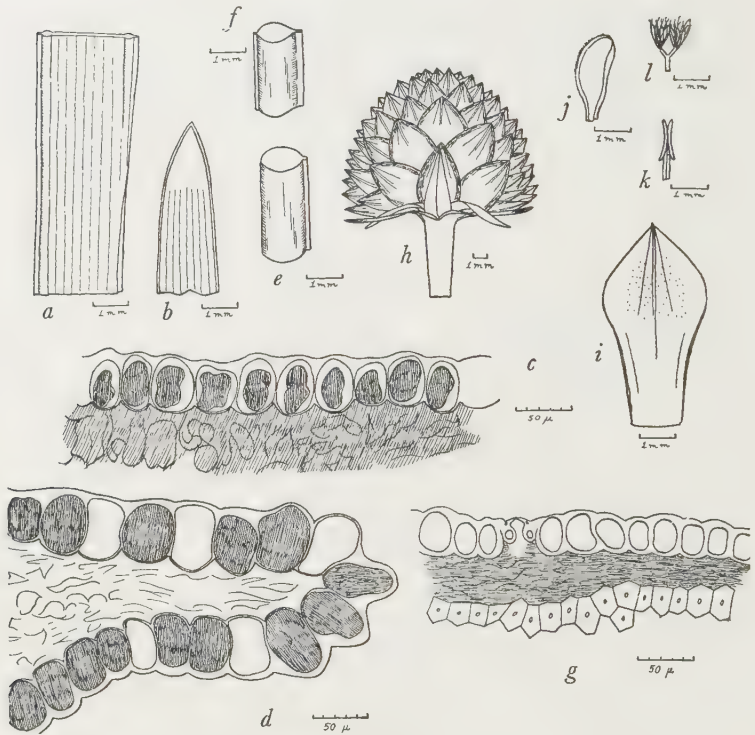


FIG. 2

At first glance this plant appears to be a variety of *Xyris involucrata* Nees, with a short involucre and undoubtedly it is a close relative. However, the glabrous leaves and scape and the markedly different floral bracts (cf Idrobo, Cالداسيا, 6(29): 212, Fig. 12e, 1954) indicate that *Xyris egleri* is a distinct species.

***Xyris* (Nematopus) hatschbachii** Smith and Downs, new species

Fig. 3

Subbulbosa; radicibus tenuibus; foliis spiraliter ordinatis, vix manifeste distichis, ensiformi-linearibus, ad 20 cm longis, glabris; vaginis 4–8 cm longis, superne quam laminis haud latioribus, eligulatis, basi valde dilatatis et aterrimo-castaneis; laminis spiraliter tortis, haud 1.5 mm latis, acuminatis, viridibus, transverse rugulosis, ex sicco plus minusve nervatis, nervis submarginalibus haud incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus lateralibus in sectione transversa subaequalibus, suborbicularibus, 35–40 μ altis, parietibus exterioribus 10–15 μ crassis, alteris multo tenuioribus, cellularum parte

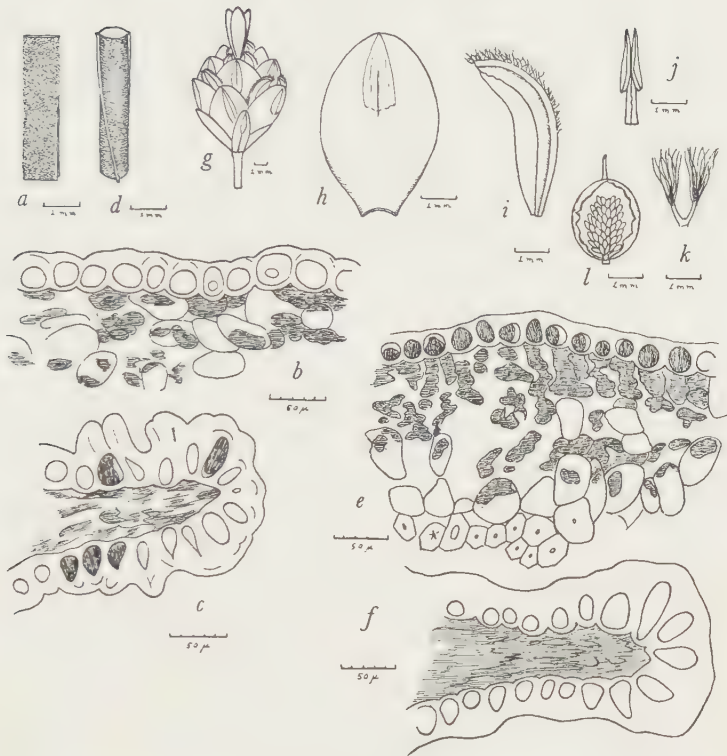


FIG. 3

intima non persistente, cellulis marginalibus irregulariter prominentibus incrassatisque; scapis terminalibus, spiraliter tortis, ad 33 cm altis, 1 mm diametro, minute rugulosi, bicostati; cellulis epidermalibus in sectione transversa earum foliorum valde similibus sed parte intima persistente, eis costarum prominentibus et cum parte intima non persistente; vagina scaporum quam foliis subduplo brevioribus, breviter laminatis; spica submultiflora, subglobosa, 8–9 mm longa; bracteis imbricatis, infimis valde reductis, florigeris late ellipticis rotundatisque, sepala subaequantibus, integris, fragilibus sed vix scarioso-marginatis, ex sicco aureo-brunneis, sublucidis, late convexis, area dorsali lanceolata cinereo-viridi 2.3 mm longa praeditis, plus minusve uninerviatis, glabris; sepalis lateralibus liberis, valde inaequilateralis, falcato-oblongis, acutis, 4.7 mm longis, ala carinali angusta, supra medium dense rufo-fimbriata; limbo petalorum obovato-elliptico, 4 mm longo; antheris oblongis, valde retusis, ca. 2 mm longis; staminodiis bibrachiatis, penicillatis; placentis basalibus.

Type in the Herbário Anchieta, No. 36.939, collected in sandy campo, Serra São Luis de Purunã, Município de Campo Largo, State of Paraná,

Brazil, altitude 1150 m. 6 January 1948, by G. Hatschbach (No. 828). Negative No. 5457 in the U. S. National Herbarium.

The lateral sepals of *Xyris hatschbachii* are densely rufous-fimbriate on the upper half of the keel but not tufted at the apex. This character and others would relate it to *X. organensis* Malme, from which it differs in its rugulose leaves and scape and in its much smaller sepals. Its leaves are like those of *X. graminosa* Pohl ex Mart. only narrower, but its lateral sepals are no longer than the bracts and not white-tufted at apex.

***Xyris (Nematopus) mima* Smith and Downs, new species**

Fig. 4

Caespitosa, acaulis; radicibus gracillimis; foliis manifeste distichis, ad 7 cm longis, ensiformi-linearibus, transverse rugulosis, subconcoloribus,

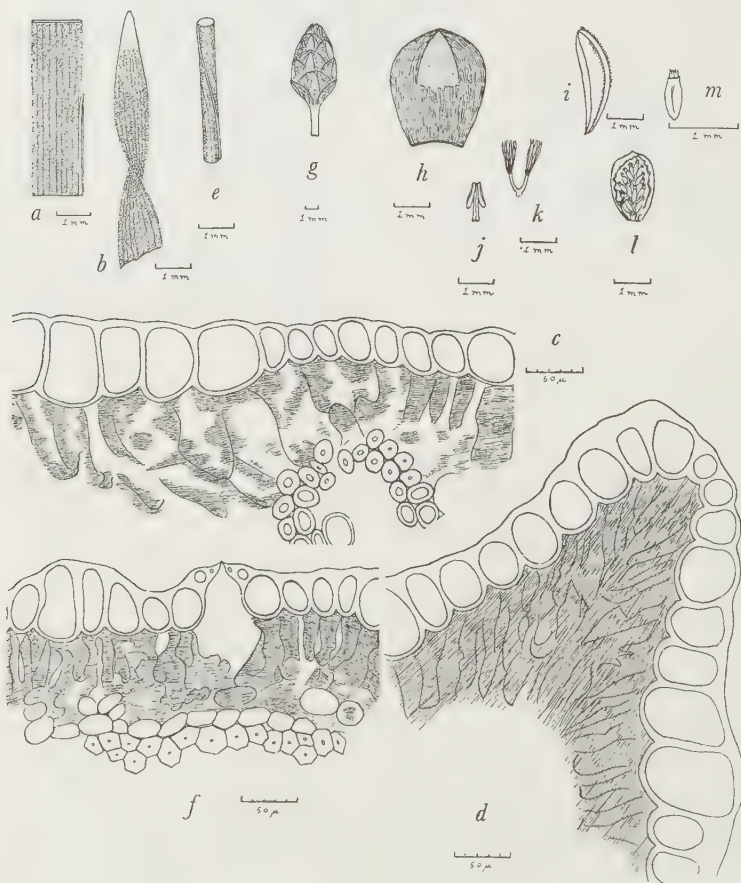


FIG. 4

eciliatis sed margine tuberculatis; vaginis obscuris, ca. tertiam partem folii occupantibus, superne quam laminis haud latioribus, apice ligula parva acuta auctis, basi rubescentibus et vix dilatatis; laminis spiraliter tortis, ad 2 mm latis, acuminatis et apice asymmetricè acutis vel subobtusis, leviter nervatis, nervis submarginalibus haud vel vix incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus lateralibus in sectione transversa valde inaequalibus, 35–85 μ altis, oblongis vel suborbicularibus, parietibus subaequalibus, ca. 5 μ crassis, cellulis marginalibus extus haud vel valde incrassatis; scapis terminalibus, plus minusve tortis, gracilibus, ad 17 cm altis, subteretibus, rugosis, bicostatis; cellulis epidermalibus in sectione transversa valde inaequalibus; vagina scaporum brevissime laminata, quam foliis subduplo brevior; spica ellipsoidea, 9 mm longa, 15–20 flora; bracteae arcte imbricatis, infimis valde reductis, florigeris late ellipticis, apice late rotundatis, sepala superantibus, integris, late convexis, glabris, ex sicco aureis, area dorsali lanceolata cinereo-viridi 1.5 mm longa praeditis; sepalis lateralibus liberis, subaequilateralis, navicularibus, obtusis, 3 mm longis, carina brevissime setoso-ciliata; limbo petalorum late elliptico, 2 mm longo; antheris oblongis, 0.8 mm longis; staminodiis bibrachiatis, penicillatis; ovario crasse ellipsoideo; placentis basalibus; seminibus ellipsoideis, 0.5–0.7 mm longis, apice coma paleacea pallida coronatis.

Type in the U. S. National Herbarium, No. 2,283,911, collected on artificial sandy field, Missão Nova, Rio Cururú, region of the upper Rio Tapajós, State of Pará, Brazil, 12 July 1959, by W. A. Egler (No. 791) and Raimundo. Isotype in Museu Paraense "Emílio Goeldi" (No. 23,767).

In general habit, *Xyris mima* is practically indistinguishable from *X. paraensis* Poepp. ex Kunth and its staminodes are penicillate also, but its leaves are finely rugose like those of typical *X. savanensis* Miq. The seeds of *X. mima*, however, have an apical coma of scales, while the seeds of the other two species are biapiculate and without any scales. Thus *X. mima* can scarcely be considered an intermediate as it would seem at first glance.

***Xyris (Nematopus) moraesii* Smith and Downs, new species**

Fig. 5

Caespitosa, acaulis; radicibus tenuissimis; foliis spiraliter ordinatis, vix manifeste distichis, ensiformi-linearibus, ad 30 cm longis, concoloribus; vaginis inconspicuis, angustis, superne quam laminis haud latioribus, eligulatis, basi vix dilatatis, juvenilibus molliter albido-ciliatis; laminis 1.5 mm latis, acuminatis, glabris, nervatis, nervis submarginalibus haud incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus in sectione transversa oblongis, ca. 70 μ altis, 30–40 μ latis, parietibus subaequalibus vel exterioribus paulo incrassatis, marginalibus extus valde incrassatis; scapis spiraliter tortis, ad 50 cm altis, subteretibus, pluricos-tatis, costis majoribus dense minuteque ciliatis, alibi laevibus; cellulis epidermalibus in sectione transversa oblongis cum luminibus globosis, 35–45 μ altis, parietibus exterioribus ca. 15 μ crassis, alteris multo tenu-

ioribus, eis costarum et subcostarum majoribus, extus valde incrassatis; vagina scaporum sine lamina, ad 10 cm longa; spica subglobosa, 7–8 mm diametro, pluriflora; bracteis laceratis, infimis valde reductis, florigeris suborbicularibus, sepala superantibus, opacis, ex sicco aureo-brunneis, minute granulosis, area dorsali parva angusta viridi praeditis; sepalis lateralibus liberis, subaequilateris, lanceolatis, acutis, 5 mm longis, carina lata, obscure sparseque denticulata; placentis basalibus; seminibus ellipsoideis, biapiculatis, 0.3 mm longis.

Type in the U. S. National Herbarium, No. 2,325,427, collected on flat sandy shores, State of Paraíba, Brazil, 30 August 1959, by Jayme Coêlho de Moraes (No. 2224).

In most of its diagnostic characters, *Xyris moraesii* appears related to *X. nilssonii* Malme, but differs in its eciliate evenly nerved leaf-blades, subglobose spikes, and dark-margined bracts. No locality within Paraíba is given, although probably the collection was made in the vicinity of the Escola de Agronomia do Nordeste, Areia, where the late Professor Moraes taught.

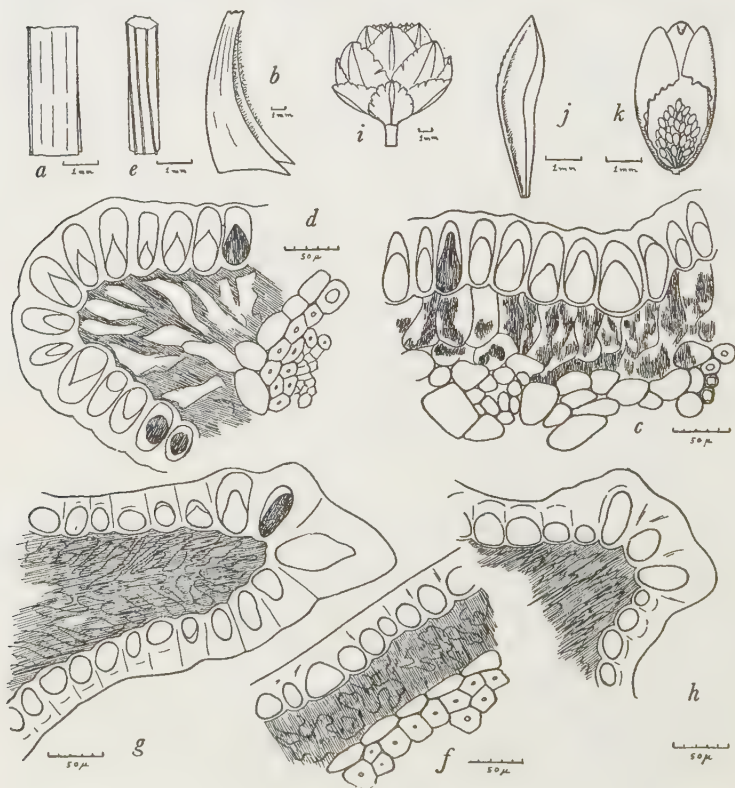


FIG. 5

Xyris (Nematopus?) piresiana Smith and Downs, new species

Fig. 6

Caespitosa, acaulis; radicibus tenuibus; foliis manifeste distichis, ensiformi-linearibus, ad 25 cm longis sed nonnullis sine laminis; vaginis angustissime triangularibus, ad 35 mm longis, superne quam laminis latoribus, atro-castaneis, anguste pallido-marginatis, glabris, lucidis, basi levissime auriculatis, apice ligula acuta 3 mm longa praeditis; laminis ad 2.5 mm latis, margine pallidis valde incrassatisque, latere plus minusve granulosis, margine interiore basi minute pubescente, alibi glabris, per aetate rubescentibus; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus lateralibus in sectione transversa uniseriatis, oblongis, 60–100 μ altis, luminibus sat magnis, parietibus exterioribus ca. 20 μ crassis, alteris multo tenuioribus, cellulis marginalibus multiseriatis, ab eis lateralibus abrupte distinctis, polygonatis cum luminibus minimis, 20–60 μ diametro; scapis spiraliter tortis, ad 34 cm altis, superne complanatis sed haud costatis, minute granulosis; cellulis epidermalibus in sectione trans-

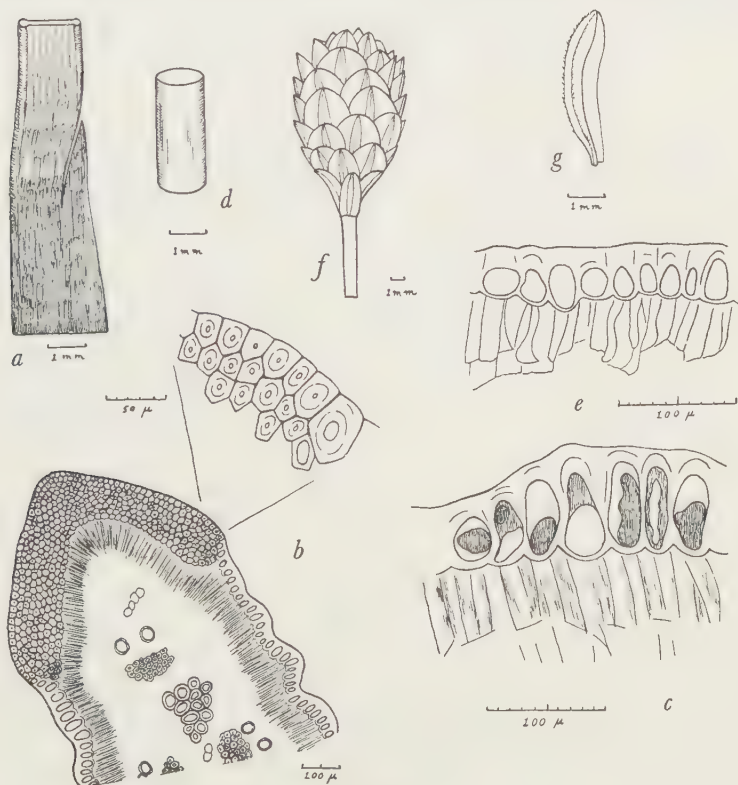


FIG. 6

versa oblongis, 40–50 μ altis, parietibus exterioribus 15–20 μ crassis, alteris tenuibus; vagina scaporum breviter laminata, eas foliorum duplo vel triplo superante; spica ellipsoidea, 10–12 mm longa, multiflora; bracteis arcte imbricatis, infimis valde reductis, ellipticis, area dorsali longa praeditis, florigeris late ellipticis, apice late rotundatis et macula rubra praeditis, sepala superantibus, integris, area dorsali oblonga 2–3 mm longa praeditis, haud carinatis, brunneis, glabris; sepalis lateralibus liberis, inaequilateris, suboblongis, apice late rotundatis, ala carinali angusta, minute ciliata; limbo petalorum elliptico, 2 mm longo; antheris oblongis.

Type in the New York Botanical Garden, collected at the airport, Serra do Cachimbo, State of Pará, Brazil, altitude 425 m, 18 December 1956, by J. M. Pires, G. A. Black, J. J. Wurdack, and N. T. Silva (No. 6457).

Paratypes: BRAZIL: Pará: Rio Cururú, upper Rio Tapajós Basin: Wet sand, Creputiá, Egler and Raimundo 1226 (MG, US); 1250 (MG, US). Missão Velha, Egler and Raimundo 1284 (MG, US).

The broad leaf-sheaths of *Xyris piresiana* place it with south Brazilian species like *X. lucida* Malme, but the rounded short-ciliate sepals distinguish it from this group. The paratypes are more slender plants with narrower leaves but do not differ in any essential character.

***Xyris (Nematopus) ramboi* Smith and Downs, new species**

Fig. 7

Caespitosa, subbulbosa sed subcaulescens; rhizomate crasso, brevi, verticali; radicibus tenuibus; foliis manifeste distichis, ensiformi-linearibus, valde applanatis, ad 11 cm longis; vaginis ca. dimidiam partem folii occupantibus, opacis, superne quam laminis haud latioribus, eligulatis, basi valde dilatatis et atris, valde tuberculatis; laminis 4–6 mm latis, sursum angustatis, apice asymmetrice rotundatis vel late acutis, in sicco paulo striatis, utroque latere basi valde tuberculatis sed sursum gradatim decrescentibus, aciebus minute denseque ciliatis, nervis submarginalibus haud vel vix incrassatis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus lateralibus in sectione transversa subaequalibus, 70–90 μ altis, parietibus exterioribus ca. 10 μ crassis, alteris etiam tenuioribus, cellulis marginalibus altioribus, parietibus exterioribus ad 40 μ crassis; scapis terminalibus et lateralibus, vix spiraliter tortis, ad apicem versus bicostatis, 8–20 cm altis, costis dense ciliatis exclusis fere 1 mm diametro, alibi glabris, ad basin versus minutissime tuberculatis; cellulis epidermalibus in sectione transversa 50 μ altis, parietibus exterioribus ad 20 μ crassis, alteris multo tenuioribus; vagina scaporum quam foliis brevior, in apiculum foliaceum brevem excurrente, brunnea; spica submultiflora, ellipsoidea, 10–13 mm longa; bracteis vetustis solum cognitis, patentibus, ellipticis, late rotundatis, ad 5 mm longis, sepala subaequantibus, coriaceis, integerrimis vel apice per aetatem minute erosis, ecarinatis, uninervatis, pallide brunneis, opacis, area dorsali carentibus, laevibus, glabris, infimis reductis; sepalis lateralibus liberis, lineari-oblancoelatis, acutis, ca. 5 mm longis, subaequilateris, apice incurvata, ala carinali angusta, apice minute ciliata; placentis basalibus.

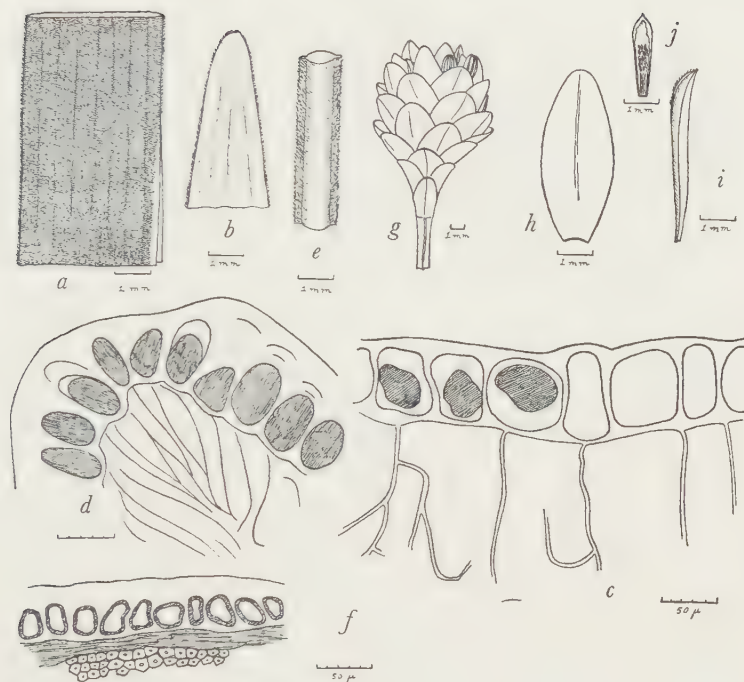


FIG. 7

Type in the Herbário Anchieta, No. 3486, collected on the airport, Caravelas, State of Bahia, Brazil, 12 January 1940, by B. Rambo. Negative No. 5472 in the U. S. National Herbarium.

The broad flat leaf-blades of *Xyris ramboi* quickly distinguish it from the nearly related *X. bahiana* Malme, but in most other characters they are very similar.

***Xyris (Nematopus) reitzii* Smith and Downs, new species**

Fig. 8

Densissime caespitosa; radicibus ad 1 mm diametro; foliis ultra 50 cm longis, glabris; vaginis superne quam laminis multo latioribus, late ligulatis, omnino atro-castaneis, sublucidis vel opacis, 9–13 cm longis, basi valde dilatatis; laminis subteretibus, paulo ultra 1 mm diametro, fascis fibro-vascularibus 7 praeditis, ad basin versus plus minusve rugulosis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus in sectione transversa uniformibus, oblongis cum lumine parva globosa vacua, 40 μ altis, parietibus exterioribus 20 μ crassis, alteris multo tenuioribus; scapis terminalibus, ad 80 cm altis vel ultra, subteretibus, ecostatis, ex sicco minute nervatis; cellulis epidermalibus in sectione transversa eis

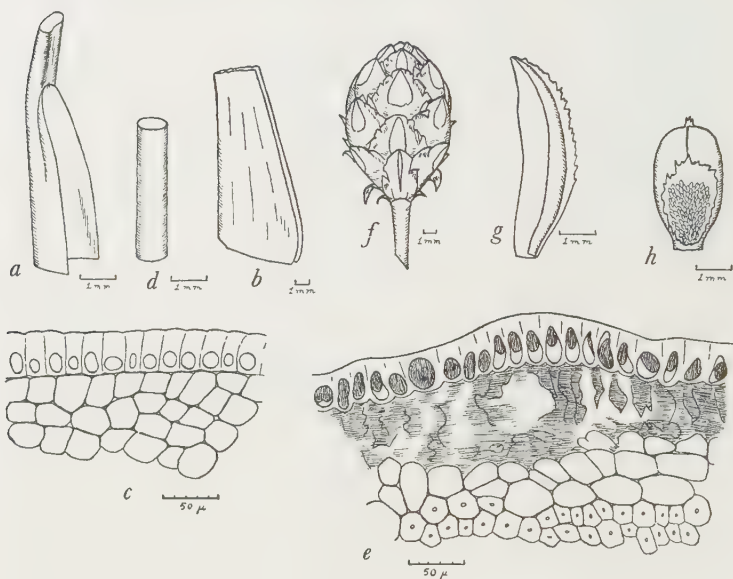


FIG. 8

foliorum similibus sed partibus interioribus praeditis; vagina scaporum 15–18 cm longa, breviter sed manifeste laminata; spica multiflora, crasse ellipsoidea, 12 mm longa; bracteis arcte imbricatis, infimis manifeste reductis, florigeris late ellipticis rotundatisque, sepala subaequantibus, margine tenuibus, mox laceratis, glabris, area dorsali ovata viridi prae-

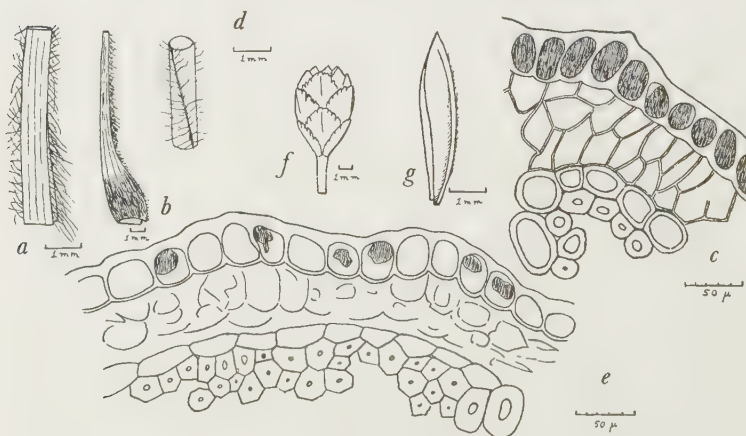


FIG. 9

ditis; sepalis lateralibus liberis, valde inaequilateris, semi-ellipticis, acutis, 6 mm longis, glabris, ala carinali supra medium dilatata et valde lacerata; placentis basalibus.

Type in the U. S. National Herbarium, No. 2,325,426, collected in bog, 5 kilometers east of Faxinal dos Guedes, Município de Xanxerê, State of Santa Catarina, Brazil, altitude 700–900 m, 3 January 1957, by L. B. Smith and Pe. R. Reitz (No. 9818). Isotypes in Herbário “Barbosa Rodrigues” and Museu Nacional, Rio de Janeiro.

Paratype: BRAZIL: Santa Catarina: Município Campo Alegre: Between Postema and Morro Iquererim, alt. 900–1000 m, 7 November 1956, L. B. Smith and R. Klein 7451 (HBR, R, US).

Xyris reitzii belongs to the difficult species complex of southern Brazil with broad dark leaf-sheaths and prominent dorsal areas. Its nearest relative is probably *X. vacillans* Malme, but it differs from all in its glabrous and broadly lacerate-carinate lateral sepals.

***Xyris* (Nematopus?) *tomentosa* Smith and Downs, new species**

Fig. 9

Caespitosa, acaulis, bulbosa: radicibus tenuissimis; foliis heteromorphis, extimis ad vaginas parvas late ovatas atro-castaneas reductis; intimis paucis laminigeris, ad 23 cm longis; vaginis intimis elongatis, superne quam laminis haud latioribus, basi paulo dilatatis, eligulatis; laminis planis, 1 mm latis, ex sicco plus minusve nervatis, margine longe denseque albo-tomentosis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus in sectione transversa uniformibus, late oblongis, 40–50 μ altis, partibus interioribus persistentibus, parietibus subaequalibus, tenuibus; scapis spiraliter tortis, gracillimis, ad 37 cm altis, lineatim albo-tomentosis; cellulis epidermalibus in sectione transversa subquadratis, 40–50 μ altis, parietibus exterioribus ca. 10 μ crassis, alteris tenuioribus; vagina scaporum breviter laminata, quam foliis duplo vel triplo brevior; spica ellipsoidea, 6 mm longa, pauciflora; bracteis arcte imbricatis, infimis paulo reductis, florigeris late ellipticis, sepala superantibus, plus minusve uninervatis, ex sicco aureo-brunneis, tenuibus, sine area dorsali, valde laceratis, apice rubro-hyalino-marginatis; sepalis lateralibus liberis, inaequilateris, suboblongis, apice rotundatis, ca. 5 mm longis, ala carinali angusta, minute pubescenti; limbo petalorum elliptico, 3 mm longo; antheris oblongis, 1.5 mm longis; staminodiis penicillatis; in ovariis perjuvenilibus placentis haud exacte visis.

Type in the U. S. National Herbarium, No. 2,324,957, collected on wet sandy soil, Erereri, Rio Cururú, region of the upper Rio Tapajós, State of Pará, Brazil, 8 February 1960, by W. A. Egler (No. 1273) and Raimundo. Isotype in Museu Paraense “Emílio Goeldi” (No. 24.320).

The conspicuous indument on the scape of *Xyris tomentosa* is reminiscent of that in *X. lanuginosa* Seub., but in *X. lanuginosa* it is evenly distributed while in our species it is confined to two vertical lines.

***Abolboda egleri* Smith and Downs, new species**

Fig. 10

Perennis; radicibus paucis, crassis; rhizomatibus brevissimis sed ramosis; foliis plurimis, densissime rosulatis; vaginis ellipticis, 5 mm longis, planis; laminis linearibus, ad 3 cm longis, 0.8 mm latis, planis, supra laevibus, subtus valde carinatis, margine incrassatis integrisque, apice seta pallida tenuissima 4 mm longa praeditis; cuticula utrinque tenuissima, vix manifesta; cellulis epidermalibus dorsalibus in sectione transversa subquadratis, 30–40 μ altis, vacuis, parietibus subaequalibus, tenuibus; cellulis ventralibus quadratis vel polygonatis, vix 20 μ diametro, luminibus minimis; cellulis marginalibus inter alias intermediis; scapo unico, ad 9 cm alto, 1 mm diametro; scapi vaginis 1-jugatis, suboppositis, submedianis, amplexantibus, lanceolatis, 9–11 mm longis, membranaceo-marginatis, apice seta brevissima praeditis; inflorescentia simplicissima, spicata, ellipsoidea, 9–10 mm longa, pauciflora; bracteis late ovatis,

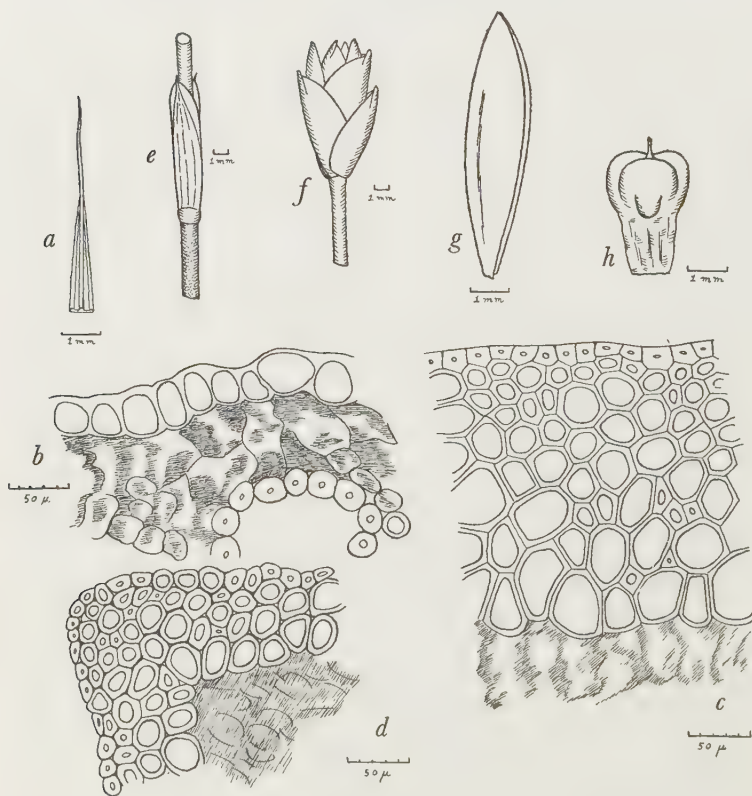


FIG. 10

breviter crasseque apiculatis, ad 7 mm longis, late convexis, induratis, apice late scarioso-marginatis, area dorsali viride carentibus, infimis fertilibus, ab alteris superatis; sepalis ellipticis, late acutis, 7 mm longis; petalis verisimiliter caeruleis.

Type in the U. S. National Herbarium, No. 2,324,956, collected on swampy ground, Erereri, Rio Cururú, region of the upper Rio Tapajós, State of Pará, Brazil, 8 February 1960, by W. A. Egler (No. 1271) and Raimundo. Isotype in Museu Paraense "Emílio Goeldi" (No. 24.318).

This *Abolboda egleri* combines the short basal bracts and long-setose leaf-apices of *A. pulchella* H. and B. with the narrow, very numerous leaves of *A. acicularis* Idrobo and Smith. It differs from both species in having the underside of the leaf-blade prominently carinate.

EXPLANATION OF FIGURES

Fig. 1.—*Xyris archeri*: *a*, apex of leaf-sheath; *b*, section of leaf-blade; *c*, section of leaf-epidermis; *d*, section of scape; *e*, spike; *f*, lateral sepals; *g*, ovary (opened); *h*, seed.

Fig. 2.—*Xyris egleri*: *a*, apex of leaf-sheath; *b*, apex of leaf-blade; *c*, section of leaf-epidermis, lateral; *d*, same, marginal; *e*, section of scape 7 cm from base; *f*, same, 7 cm from apex; *g*, section of scape-epidermis; *h*, spike; *i*, floral bract; *j*, lateral sepal; *k*, stamen; *l*, staminode.

Fig. 3.—*Xyris hatschbachii*: *a*, apex of leaf-sheath; *b*, section of leaf-epidermis, lateral; *c*, same, marginal; *d*, section of scape; *e*, section of scape-epidermis; *f*, same, of costa; *g*, spike; *h*, floral bract; *i*, lateral sepal; *j*, stamen; *k*, staminode; *l*, ovary (opened).

Fig. 4.—*Xyris mimia*: *a*, apex of leaf-sheath; *b*, apex of leaf-blade; *c*, section of leaf-epidermis, lateral; *d*, same, marginal; *e*, section of scape; *f*, section of scape-epidermis; *g*, spike; *h*, floral bract; *i*, lateral sepal; *j*, stamen; *k*, staminode; *l*, ovary (opened); *m*, seed.

Fig. 5.—*Xyris moraesii*: *a*, apex of leaf-sheath; *b*, base of leaf-sheath; *c*, section of leaf-epidermis, lateral; *d*, same, marginal; *e*, section of scape; *f*, section of scape-epidermis; *g*, same of main costa; *h*, same of subcosta; *i*, spike; *j*, lateral sepal; *k*, ovary (opened).

Fig. 6.—*Xyris piresiana*: *a*, apex of leaf-sheath; *b*, section of leaf and marginal epidermis; *c*, same, lateral; *d*, section of scape; *e*, section of scape-epidermis; *f*, spike; *g*, lateral sepal.

Fig. 7.—*Xyris ramboi*: *a*, apex of leaf-sheath; *b*, apex of leaf-blade; *c*, section of leaf-epidermis, lateral; *d*, same, marginal; *e*, section of scape; *f*, section of scape-epidermis; *g*, spike; *h*, floral bract; *i*, lateral sepal; *j*, ovary (opened).

Fig. 8.—*Xyris reitzii*: *a*, apex of leaf-sheath; *b*, base of leaf-sheath; *c*, section of leaf-epidermis; *d*, section of scape; *e*, section of scape-epidermis; *f*, spike; *g*, lateral sepal; *h*, ovary (opened).

Fig. 9.—*Xyris tomentosa*: *a*, apex of leaf-sheath; *b*, base of leaf-sheath; *c*, section of leaf-epidermis; *d*, section of scape; *e*, section of scape-epidermis; *f*, spike; *g*, lateral sepal.

Fig. 10.—*Abolboda egleri*: *a*, apex of leaf-blade; *b*, section of leaf-epidermis, dorsal; *c*, same, ventral; *d*, same, marginal; *e*, section of scape with bracts; *f*, spike; *g*, lateral sepal; *h*, ovary.

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

JAPYGIDAE OF NORTH AMERICA 7. A NEW GENUS
IN THE PROVALLJAPYGINAE FROM MISSOURI

BY LESLIE M. SMITH

University of California, Davis

In 1936, while conducting a survey of insects in the soil of peach orchards, W. F. Turner collected a single specimen of a species of japygid which presents so many unique features that it seems worth-while to record its existence. This specimen, which I shall call *Eojapyx pedis* has plumose body setae and other characters which place it in the subfamily Provalljapyginae. The characteristic of plumose body setae is found only in this subfamily and in the subfamily Evalljapyginae. No specimens of either subfamily have ever been found east of the Rocky Mountains, but are common along the Pacific Coast and in Mexico. The specimen of *E. pedis* was collected in Stoddard County, Missouri, at least a thousand miles east of its near relatives.

During the soil survey of peach orchards, several thousand specimens of *Parajapyx isabellae* (Gr.) as well as a few specimens of *Metajapyx subterraneus* (Packard) were taken. This points out the magnitude of the survey and the efficiency of collecting japygids. The capture of a single specimen of *E. pedis* therefore poses a question. It might be assumed that *E. pedis* represents a recent introduction from the Pacific Coast, especially since Stoddard County lies in the lowlands bordering the Mississippi River and therefore contiguous to marine commerce. However, anatomically, no counterparts of *E. pedis* have been found on the Pacific Coast.

The mandibles of *E. pedis* bear a resemblance to the mandibles of *P. isabellae* (Gr.) in that there are three major teeth with small secondary teeth between them. The setae in the male setose sac in the third sternite resemble those of some

species of *Nanojapyx* but are more advanced in evolution. It is possible that each of the large brush-like setae is glandular and connected by a thin sclerotized duct to a glandular, secreting cell which lies farther back in the sac, and that the enlargement on the duct is a point of attachment. Some undescribed species of *Nanojapyx* in the writer's collection appear to indicate such a structure. The tarsi of *E. pedis* have two modified setae which arise ventrally, near the pretarsus and project between the tarsal claws. Somewhat similar setae are found on *Parajapyx* (*Grassjapyx*) *ambiguous* Pages, and they are reminiscent of setae on the tarsi of certain campodeids such as *Metriocampa* and *Campodea*. In recognition of this character the species is named *pedis* (foot) and the genus from *eos* (east) since it occurs far east of its nearest relatives.

Eojapyx, new genus

Type species: Eojapyx pedis L. Smith.

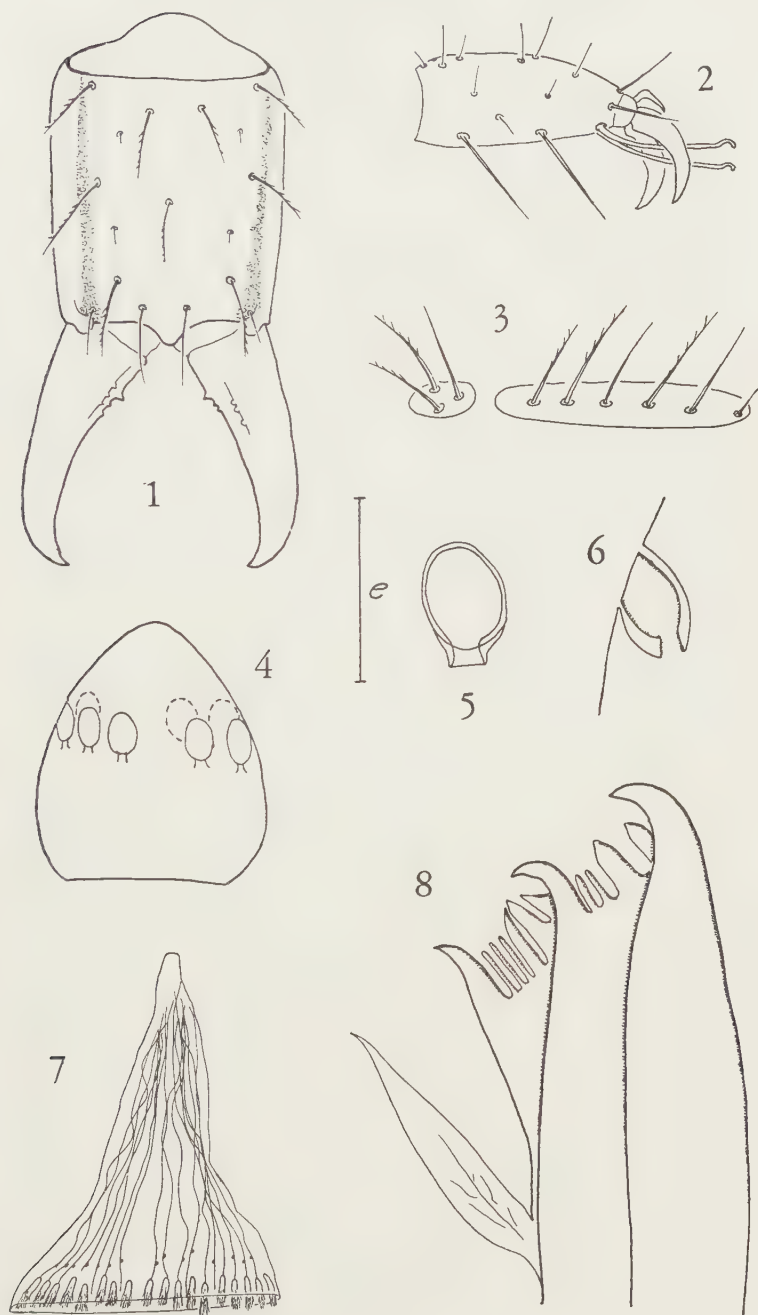
Small, under 0.4 mm long, body with many plumose setae, mandible with three large teeth bearing smaller accessory teeth on inner margin, antennae with 22 segments in type species, terminal segment of antenna with eight conspicuous placoid sensillae, legs relatively short, apical ventral setae on tarsi modified, tarsal claws equal, median claw prominent and curved, plumose setae in male sac large and with many pinnules (as illustrated) forceps nearly symmetrical, long, slender with a few basal teeth, pygidium rounded, prominent, all styli with two setae.

The genus *Eojapyx* is related to the genus *Nanojapyx* but is distinguished by the accessory teeth on the mandible, by the modified tarsal setae which project between the tarsal claws, by the smooth forceps with basal teeth only, by eight placoid sensillae on the terminal antennal segment (whereas *Nanojapyx* has only six), and by having two setae on each stylus (whereas *Nanojapyx* has only one on each).

Eojapyx pedis, new species

Male: Head: Antenna with 22 segments, trichobothria¹ typical, one-third longer than longest adjacent seta, ultimate segment slightly longer than wide, with eight placoid sensillae in an irregular whorl, each sensillum pear-shaped and recessed into a pocket, segment seven dorsal half with an irregular row of ten setae, ventrally two irregular rows of nine

¹ Abbreviations and terms: M = plumose setae, generally large; m = simple setae, generally smaller; trichobothria = special sense-setae on antennal segments IV-VI; L₃ = metathoracic leg; pleuron composed of prepleurite situated anterior to the pleurite; carinae = laterad lines of sclerotization on dorsum of segment X; Acropygidium = mid-dorsal projection of segment X to the rear; apotome = anterior sclerite of an abdominal sternum.



FIGS. 1-8

and eight setae each, segment twenty with two irregular whorls of 20 setae each, dorsum of head with four transverse rows of setae, about ten setae per row M alternating with m in the row, M with one or two pinnules, labrum with five hyaline sensory cones at tip, and 11 setae of which the median basal pair longer than the others, maxillary palpus three times as long as wide with seven setae near tip, thumb of galea with five projections, lacinia with four pectinate branches, the fifth or distal branch reduced to a slender rod, two-thirds as long as the adjacent branch, mandible with three prominent teeth, between the ventral and median teeth, four small accessory teeth; between the median tooth and dorsal tooth, six accessory teeth; thin membraneous prostheca present, labial palpi slightly clavate, three times as long as wide with two long apical setae and two shorter, subapical setae, protrusible pouches on labium typical.

Thorax: Pronotum with 7+7 M and 5+5 m, mesonotum and metanotum prescutum 1+1 M and no m, scutum with 10+10 M and 2+2 m, L₂ twice as long as greatest width of pronotum, dorsal apex of femur of all legs with a close row of three setae, of which anterior plumose, longest, the others simple, subequal, tibia L₃ with two stout, plumose setae (calcaria?) and 16 simple setae, tarsal claws subequal with median claw prominent, bent as a right angle, two long ventral setae with hooked ends project between tarsal claws, two large ventral setae per row on tarsus.

Abdomen: Tergite I prescutum 2M and no m, scutum 7+7 M with three to five coarse pinnules, and 6+6 m, sternite I with an irregular row of 9+9 small plumose setae anterior to subcoxal organs and within the limits of the styli; lateral subcoxal organs extending from near the styli to near the mid line, with one posterior row of 6+6 slender plumose sensory setae with large sockets, and one irregular row of glandular setae 13+15 half as long as sensory setae and anterior to sensory setae; median subcoxal organ absent, all styli with a slight secondary cone and two basal setae with laterad seta two and one-half times the length of mesad seta, and a basal pore between the setal sockets; tergite II with 17+17 plumose setae of various sizes with two to six pinnules 3+4 simple setae, pleuron II prepleurite with 2M and one large m, pleurite anterior to posterior 2M, m, M, m, and small m, sternum II apotome with a single row of 7+7 plumose setae alternating large and smaller, becoming smaller medially, sternite with 25+25 M with three to five stout pinnules, tergite III 24+24 plumose setae of various sizes and 4+4 simple setae, pleuron as in segment II, sternum III apotome as in segment II, sternite with opening of male setose sac surrounded by 22 short, stout plumose setae, plumose sac with 9+9 large brush-like plumose setae inside in a single row, each seta connected with a slender twisted rod with an enlargement near base of seta, segments IV to VII similar to segment II, postero-lateral angles of tergite VII not projected to rear, pleurae normal, segment VIII slightly carinate dorsally with 7+7 M and 5+5 m between carinae, sternum VIII with 9+2+9 M and 9+9 m, genital arifice oval surrounded by a ring of sixteen simple short setae, genital palpi absent, segment IX with

3+3 M dorsally, alternating with 3+3 simple setae half as long as the M, segment IX ventrally with 3+3 M alternating with 3+3 m, tergite X between carinae 4+1+4 M and four large simple setae along posterior edge, no setae in rectum, pygidium prominent, rounded, equal in length to stylus IV, segment X width 0.20 mm, length 0.25 mm, forceps nearly bilaterally symmetrical, slender, nearly straight, denticles biserial, located in basal fourth of forceps, left arm upper row three minute teeth lower row three slightly larger teeth, right arm upper row three minute denticles, lower row three slightly larger teeth, inner edge of both forceps straight, smooth, without crenulations, tips of forceps slightly curved; length of body including forceps 3.46 mm, length of forceps 0.17 mm, length of L_3 0.36 mm.

Female: Unknown.

Type: One male on a microslide with the label: Peach Orchard Survey, Stoddard County, Missouri, 25 September 1936. From W. F. Turner. T-1201, Lot 37-2482.

Type deposited in U. S. National Museum.

William F. Turner (personal communication) has supplied the following information: "Soil samples were collected from at least 10 different locations in an orchard. These samples were then thoroughly mixed before being introduced into the Berlese funnels. It was very seldom that any samples were taken at the very edge of an orchard. In any case, the samples in question were collected within 2 feet of the trunks of peach trees, and samples were not taken over 6 to 8 inches deep. The soil in the orchard was listed according to the U. S. Soil Surveys as Memphis silt loam. The top 10 to 12 inches was a brown silt (loess). This orchard was on the top of Crowley's ridge, which arises in southeast Missouri and runs south almost to the Louisiana line in Arkansas. The orchard had not been cultivated prior to harvest and the notes state that it was grown up in such weeds as *Solidago*, *Aster*, *Smilax*, *Eupatorium*, and blackberry, but that there was very little grass in the orchard. Under such circumstances the weed growth is, of course, much lighter under the trees than it is between trees. Nevertheless, there would be a considerable amount of such growth even to within 2 feet of the trunks of the trees. The soil was quite moist, it having rained just 2 days prior to the time when the soil collection was made."

In many specimens some setae may be missing. The types of missing seta, that is whether simple or plumose, can be inferred from the setal socket. Simple setae have simple, circular setal sockets whereas plumose setae have circular setal sockets with inner sclerotization leaving a U-shaped opening in which the seta may move backwards or forwards only. This generalization holds for body setae (but not setae on the head or appendages) in the Evalljapyginae as well as the Provalljapyginae.

The gut contents of the specimen are amorphous and show no insect or mite parts. The delicate structure of the mandibles may indicate that this species has abandoned the predatory habit completely. The absence

of such specimens from all japygid collections which I have examined suggests that they normally occur at considerable depths in the soil.

EXPLANATION OF FIGURES

All figures are of *Eojapyx pedis* L. Smith from male specimen cleared, stained and mounted in balsam.

Fig. 1.—Dorsal view of tenth segment and forceps with all setae between carinae shown, and all other setae omitted, $e = 0.15$ mm.

Fig. 2.—Lateral view of metatarsus, $e = 0.048$ mm.

Fig. 3.—Lateral view of pleuron II showing prepleurite and pleurite, $e = 0.084$ mm.

Fig. 4.—Dorsal view of terminal antennal segment showing 8 placoid sensillae. All setae omitted, $e = 0.028$ mm.

Fig. 5.—Dorsal view of placoid sensilla, $e = 0.001$ mm.

Fig. 6.—Lateral view of placoid sensilla, $e = 0.001$ mm.

Fig. 7.—Ventral view of male setose sac, $e = 0.053$ mm.

Fig. 8.—Ventro-median view of left mandible with prosthema, $e = 0.015$ mm.



PROCEEDINGS
OF THE
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A NEW SUBSPECIES OF THE CLIFF CHIPMUNK
FROM CENTRAL CHIHUAHUA

BY WILLIAM Z. LIDICKER, JR.

*Museum of Vertebrate Zoology,
University of California, Berkeley*

Recent collections made by field parties of the Museum of Vertebrate Zoology from numerous localities in Chihuahua have revealed that the cliff chipmunks (*Eutamias dorsalis*) inhabiting the relatively isolated Sierra del Nido have evolved to the point of subspecific distinctness. Numerous differences exist between the chipmunks of the Sierra del Nido and those representing all other nearby races of *E. dorsalis*. Furthermore, many of these differences are in seemingly unrelated characters so that considerable genetic divergence is indicated. This unique population of chipmunks is formally described below. Measurements were obtained only from individuals which had well-worn molariform teeth.

***Eutamias dorsalis nidoensis*, new subspecies**

Type: Male, adult, skin, skull, and stained baculum; no. 124831, Mus. Vert. Zool., from 5 mi N Cerro Campana, 5600 ft, Chihuahua, Mexico; collected by W. Z. Lidicker, Jr., on 5 July 1959; original no. 1961.

Range: It is known to inhabit the Sierra del Nido complex of high country which includes the Sierra Santa Clara and Cerro Campana as well as the Sierra del Nido proper. Individuals have been collected or observed within an altitudinal range of from 5600 feet to over 8000 feet, although they are most common above 6000 feet. Although these mountains are relatively isolated by surrounding desert and grassy plains, *E. d. nidoensis* probably intergrades with the subspecies inhabiting the Sierra Madre de Occidental to the northwest in the vicinity of San Buenaventura. Its range is separated by about 250 miles from that of *E. d. carminis* in the Sierra del Carmen of Coahuila.

Diagnosis: A sample of 19 specimens from five localities in the Sierra del Nido area has the following diagnostic features. Body size large,

averaging over 134 mm in length (total length minus tail length); tail very short and hind foot moderately short, averaging 92.4 and 34.3 mm in length respectively. Distinctive cranial features include a relatively long maxillary toothrow which averages 5.42 mm in crown length. The skull is relatively broad through the interorbital region, the least breadth measuring from 8.5 to 9.8 mm and averaging 9.09 mm. In contrast to this the breadth across the zygomatic arches is relatively narrow, averaging only 19.90 mm. Moreover, the nasal bones are relatively broad, particularly anteriorly. This is a difficult character to measure adequately, since it is determined in part by the area of the laterally curving portion of the nasals. Nevertheless, this difference was at least partially measured by determining the breadth across both nasals at the junction of the anteriormost process of the premaxillary and the nasals. Nasal breadth measured in this way averages 4.06 mm. See Table 1 for a fuller description of the statistical spread of these measurements.

These chipmunks are, in general, gray with a strong suffusion of whitish hairs, and a dull reddish under-fur color especially in the shoulder region. The dorsal stripes are indistinct. A median black dorsal stripe is always present but it is suffused with whitish hairs, even in summer pelage, so its over-all aspect is indistinct. The pair of brown stripes immediately lateral to the central stripe, often present in this species, is either not present or barely perceptible. Lateral to this area is an indistinct white stripe which is ordinarily visible but tends to blend into the background color. In a few individuals there is an additional brown stripe which is barely visible lateral to this last white stripe. The flanks are similar to the back but have a slight rusty tinge. The facial stripes are dark brown and distinct, and the ventral side of the tail and anal region are a dull rusty color. The winter and summer pelages differ relatively little, although the summer pelage is shorter, slightly less red, and has slightly more prominent dorsal stripes.

Comparisons: This population of chipmunks needs to be compared primarily with that of the Sierra Madre de Occidental, which is now included in the subspecies *dorsalis*, and with *E. d. carminis* Goldman from the Sierra del Carmen in Coahuila. It is these two populations with which *nidoensis* is likely to be closely related. Careful comparison reveals that it is more closely related to chipmunks of the Sierra Madre, than to those of the Sierra del Carmen.

In any discussion of color in chipmunks, it seems pertinent to consider whether or not the specimens being compared are in comparable molt stages. Fortunately the series from the Sierra del Nido consists of some individuals in winter pelage, some in summer, and some in mixed pelage. The various collections from the Sierra Madre also contain all three types of pelage. Color comparisons can thus be made between comparable individuals. The specimens from the Sierra del Carmen were all collected in April and hence are in winter pelage, but comparisons with other individuals in winter pelage seem appropriate.

E. d. nidoensis can be distinguished from *E. dorsalis* of the Sierra

TABLE 1.—Measurements of three populations of *Eutamias dorsalis*.

POPULATION		BODY LENGTH	TOTAL LENGTH	TAIL LENGTH	HIND FOOT LENGTH	EAR LENGTH	CRANIAL LENGTH	MASTOID BREADTH	INTER-ORBITAL BREADTH	ZYGO-MATIC BREADTH	NASAL WIDTH	CROWN LENGTH OF MAXILLARY TOOTHROW	WEIGHT ^o in grams	
													♂	♀
Sierra del Nido	n	18	16	16	18	18	16	16	18	18	16	18	10	5
	max.	143	242	102	36	23	38.5	17.4	9.8	20.5	4.5	5.7	67.9	79.2
	min.	122	214	76	31	18	35.9	16.5	8.5	19.5	3.8	5.1	58.3	69.2
	$\bar{x}$	134.2	227.4	92.4	34.25	20.0	37.28	16.83	9.09	19.90	4.06	5.42	62.6	75.4
	SE $\bar{x}$	1.356	2.400	1.958	0.330	0.309	0.195	0.075	0.080	0.071	0.045	0.045	0.997	1.602
Sierra Madre de Occidental	n	25	23	23	25	25	28	27	28	26	28	28	11	13
	max.	149	253	116	37	23	38.9	17.5	9.5	21.1	4.3	5.7	77.0	95.7
	min.	109	220	87	34	19	35.5	16.3	8.3	19.3	3.7	4.8	60.0	61.0
	$\bar{x}$	130.0	233.1	102.7	35.80	21.2	37.02	16.84	8.91	20.14	3.95	5.25	67.6	75.4
	SE $\bar{x}$	1.704	1.723	1.375	0.204	0.268	0.157	0.060	0.066	0.086	0.032	0.036	1.578	3.025
Sierra del Carmen	n	10	10	10	11	11	11	11	7	11	6	7	1	4
	max.	142	239	113	36	25	38.6	17.5	9.1	21.0	4.1	5.6	—	69.2
	min.	123	211	81	31	18	36.3	16.6	8.5	19.6	3.7	5.0	—	56.8
	$\bar{x}$	130.8	222.3	91.5	33.5	21.0	37.28	16.93	8.81	20.27	3.88	5.31	66.9	65.6
	SE $\bar{x}$	2.038	3.073	2.886	0.455	0.714	0.193	0.117	0.112	0.380	0.073	0.084	—	2.950

^o Includes all males, and females which are not pregnant or with embryos less than 10 mm in CR length.

Madre de Occidental by a number of skeletal and color features. Table 1 summarizes the information on the skeletal features studied for these two populations and for *E. d. carminis*. For those features which did not seem to show significant sexual dimorphism, values for males and females were combined. As can be seen from Tables 1 and 2, *nidoensis* has a

TABLE 2.—Comparison of populations from the Sierra del Nido and Sierra Madre de Occidental with respect to selected skeletal features.

CHARACTER	n	t-VALUE	LEVEL OF SIGNIFICANCE
Tail length	39	4.44	<.001
Hind foot length	43	4.21	<.001
Maxillary toothrow	46	2.93	.008
Body length	43	2.37	.024
Nasal width	44	2.09	.045
Zygomatic breadth	44	2.00	.053
Interorbital breadth	46	1.72	.095

significantly shorter tail and hind foot, longer body and maxillary toothrow, narrower zygomatic breadth, and broader nasals and interorbital breadth than *dorsalis* from the Sierra Madre. Other measurements studied which did not show significant differences (at least below the 10 per cent level of confidence) are total length, ear length, cranial length, mastoid breadth, and body weight. *E. d. nidoensis* also has less distinct dorsal striping and tends to have a slightly less prominent rusty stripe on the flanks. By contrast, the median black stripe of *dorsalis* tends to be more distinct (less infiltrated with whitish hairs), broader, and more extended anteriorly. Also the first lateral brown stripe of *dorsalis* is almost always more distinct, as is the white stripe lateral to it. Furthermore, the second brown lateral stripe is distinct in about half of the specimens of *dorsalis* and barely perceptible in the rest. These differences hold true for both the winter and summer pelages.

Another possible difference between *nidoensis* and *dorsalis* which may be highly significant is the size of the baculum. Three bacula were available from the series of *nidoensis*. These were cleaned, stained, and stored in glycerin according to the method used by Lidicker (1960) and compared with the descriptions of *dorsalis* bacula presented by White (1953). Measurements were made with an ocular micrometer. White utilized in his description of *dorsalis* nine bacula from specimens of *E. d. dorsalis* including three from the Sierra Madre de Occidental. Although three bacula are not an adequate sample, they are very similar in their measurements in spite of the fact that the smallest of the three is from a slightly younger individual (see Table 3). Furthermore, it is of great interest that they differ considerably from White's sample. In over-all proportions they are very similar except that all three have an enlarged

TABLE 3.—Measurements in mm of three bacula of *Eutamias dorsalis nidoensis*.*

MVZ CAT. NO.	TOTAL LENGTH	SHAFT LENGTH	MAX. WIDTH OF SHAFT	HEIGHT OF KEEL	LENGTH OF TIP	LATERAL WIDTH OF BASE
121743	4.96	4.08	0.37	0.37	1.26	0.67
124827	4.81	3.86	0.30	0.30	1.11	0.67
124831	4.89	3.92	0.37	0.37	1.19	0.89
mean	4.89	3.95	0.35	0.35	1.19	0.74

* For an explanation of terms, see White, 1953.

base which has a lateral diameter of about twice the greatest width of the shaft. There is also a slight medial notch on the proximal end of the base. Apparently neither of these features was present in White's material. In addition, the three *nidoensis* bacula are much larger. They average 3.95 mm in shaft length (instead of 2.64 to 3.69 mm), the greatest width of the shaft (other than the base) averages .35 mm (instead of < .20 mm), and the height of the keel is not quite one-third of the length of the tip (instead of equal to $\frac{1}{3}$ or $\frac{1}{5}$, see pages 616 and 620 of White). If these differences between *nidoensis* and *dorsalis* should persist when larger samples are examined, they will indicate a distinction which is probably of considerable significance.

Compared to *E. d. carminis*, *nidoensis* has a longer body and tail, slightly longer hind foot, broader interorbital region and nasal breadth, narrower zygomatic breadth, and longer maxillary toothrow. In all four of these cranial features and in body length, *nidoensis* is more divergent from *carminis* than is the *dorsalis* population of the Sierra Madre. On the other hand, *nidoensis* approaches *carminis* slightly in color features. *E. d. carminis* is definitely darker, however, with a dark reddish undertone, and has less distinct dorsal stripes. It also has rustier thighs, a deeper shade of rusty on the flanks, and the facial stripes are broader and more rusty with the white spaces between being a dull gray. All specimens examined had a dark rusty ventral tail stripe which did not overlap in color with *nidoensis* or *dorsalis*. The dorsal surface of the tail is darker because the white tipped hairs are less numerous and have shorter white bands.

In the characterization of *E. d. carminis*, measurements cited by Baker (1956) for four females from two localities in the Sierra del Carmen were added to my figures where the measurements seemed comparable. This served to increase the sample size somewhat for some characters. Unfortunately no bacula were available from this subspecies.

Remarks: The Sierra del Nido population is given subspecific status not only because of the large number of highly significant differences between it and the populations of both the Sierra Madre de Occidental and the Sierra del Carmen, but also because many of the distinguishing

features of *nidoensis* are not intermediate between *dorsalis* and *carminis* thus suggesting that *nidoensis* is not merely a step along a gradual east-west cline. Furthermore, since many of the diagnostic features of *nidoensis* seem to vary independently, they are probably genetically independent (for example the inverse relationship between body length and zygomatic breadth) and a considerable degree of genetic differentiation is indicated. This apparent genetic distinctness is undoubtedly made possible in large part by the almost complete geographical isolation of this population from any other of the same species. Moreover, this isolation was very likely accentuated during the xerothermic period of 4000 to 8000 years ago. In summarizing the differences between the three populations, it seems as if *nidoensis* differs greatly from both *dorsalis* and *carminis* in cranial features, but slightly more from *dorsalis*. On the other hand, it differs more from *carminis* than from *dorsalis* in color features.

It is not within the realm of this report to consider the relative differentiation of the Sierra Madre de Occidental population of *E. dorsalis* with that in adjacent New Mexico and Arizona. Nevertheless, the availability of J. A. Allen's name *canescens* makes some comment on this desirable. His description of *canescens* was based on nine specimens from Guanacevi in northwestern Durango (Allen, 1904). It seems clear from his description that this is the same subspecies as that sampled in this report from the Sierra Madre. To check its relationship to typical *dorsalis*, the color of the Sierra Madre population was compared with that of 11 topotypes of *E. dorsalis* and two near topotypes from adjacent Arizona. No obvious differences were noted. The Sierra Madre population is, therefore, here tentatively considered to be included in the subspecies *dorsalis*.

Specimens examined: All are in the collection of the Museum of Vertebrate Zoology.

E. d. dorsalis

A total of 48 from the following localities: ARIZONA: Greenlee County: Blue, 6000 ft, 1; Rose Peak, 8700 ft, 1. NEW MEXICO: Grant County: 2 mi W Santa Rita, 6300 ft, Fort Webster (copper mines), 5; 3 mi SW Santa Rita, 6300 ft, Fort Webster (copper mines), 6. CHIHUAHUA: Rio Gavilan, 7 mi SW Pacheco, 5700 ft, 8; Sierra Azul, 12 mi SW Pacheco, 7200 ft, 1; Water Cañon, 7200 ft, 3 mi S Colonia Garcia, 4; Meadow Valley, 5 mi S Garcia, 7500 ft, 1; 9 mi SE Colonia Garcia, 8200 ft, 1; Yaguirachic, 8500 ft, 130 mi W Chihuahua, 8; 7 mi SW El Vergel (= Lagunita), 7800 ft, 1; La Union, 8400 ft, 10 km N Guachochic, 11.

E. d. nidoensis

A total of 19 from the following localities: CHIHUAHUA: Arroyo del Nido, 7000 ft, 30 mi SW Gallego, 6; Arroyo del Nido, 8000 ft, 30 mi SW Gallego, 1; Arroyo Mesteño, 7600 ft, Sierra del Nido, 2; Cañon del Alamo, 7300 ft, Sierra del Nido, 8; 5 mi N Cerro Campana, 5600 ft, 2.

E. d. carminis

A total of 7 from the following localities: COAHUILA: 5 mi W Piedra

Blanca, 5000 ft, Sierra del Carmen, 1; 8 mi SW Piedra Blanca, 7000 ft, Sierra del Carmen, 2; 8 mi SW Piedra Blanca, 7500 ft, Sierra del Carmen, 4.

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PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

MILLIPEDS COLLECTED IN GUATEMALAN CAVES,
INCLUDING *CALYMMODESMUS INQUINATUS*, N. SP.
(STYLODESMIDAE: POLYDESMIDA)

BY NELL B. CAUSEY¹

Fayetteville, Arkansas

In June, 1959, William W. Varnedoe, Jr., collected four species of millipeds from Guatemalan caves, of which all are in limestone except La Cueva Camán, which is in volcanic ash. Three species of the millipeds, a colobognath and two spirostreptids, are undoubtedly epigean forms. There are no troglotic representatives of the orders that they belong to. The fourth species is a small polydesmid of the genus *Calymmodesmus* without any apparent cave modifications other than the yellowish white body color. Additional collections from epigean sites in the vicinity of the cave are needed to establish the ecological classification of this polydesmid.

The male holotype and a female paratype of *Calymmodesmus inquinatus*, n. sp., are in the American Museum of Natural History, and male and female paratypes are in the United States National Museum. All of the remaining specimens in Varnedoe's collection will be retained by the author.

Genus *Calymmodesmus* Carl

Calymmodesmus Carl, 1914, Mém. Soc. Sci. nat. Neuchât., 5: 959. Attems, 1931, Zoologica, 30: 140-142; 1940, Tierreich, Lief. 70: 274-275. Schubart, 1952, An. Acad. Bras. Ciên., 24: 438. Loomis, 1959, Jour. Kansas Ent. Soc., 32: 1-2.

Type species: Calymmodesmus andinus Carl 1914.

Range: Ecuador to Mexico.

Number of species: Ten, of which several are myrmecophilous and one is cavernicolous.

¹ This investigation was supported by Grant No. G14486 from the National Science Foundation.

Yucodesmus, a genus closely related to *Calymmodesmus*, is represented by four species from Yucatan caves (Chamberlin, 1938) and one myrmecophilous species from Vera Cruz (Chamberlin, 1947). In the description of no species of *Yucodesmus* is the presence of minute spicules on the metazonites mentioned; this is a character of the genus *Calymmodesmus*, and its absence in *Yucodesmus* justifies the retention of *Yucodesmus*, at least as a subgenus. Schubart (1952) distinguished between *Calymmodesmus* and *Yucodesmus* by differences in the gonopods, which he did not point out, and by (in *Yucodesmus*) the equal size of the primary tubercles in the four longitudinal rows, the greater lateral projection of the pore cones, and the yellowish white color. Loomis (1959) suggested that the two genera are synonyms but deferred his decision until he had seen specimens of *Yucodesmus*.

The lobation of the collum and the paranota is not uniform through the species of *Calymmodesmus*. In *andinus* Carl from Columbia, the only species with 10 lobes on the margin of the collum, the outer lobe on either side is markedly broader than any of the eight intervening lobes and has a slight median emargination. In *bensifer* Loomis from Oaxaca and *carli* Attems from Ecuador the three outer lobes on either side form two very broad lobes with their component parts but faintly distinguishable, whereas the six intervening lobes are conspicuous. In the remaining species the outermost lobes of the collum are better developed than in the three named above and are almost equal to the intervening lobes. The paranota of segments 2 through 5 have three lateral marginal lobes each. On segments 6 through 16 there are usually four lobes, rarely three. The number of lateral lobes on segments 17, 18, and 19 is variable; usually there are four, sometimes there are three, occasionally five; on segment 19 they are present, absent, or very faintly indicated. The margin of the tergite of segment 20 is divided into six lobes, of which the middle two are closer together than any of the others.

***Calymmodesmus inquinatus*, new species**

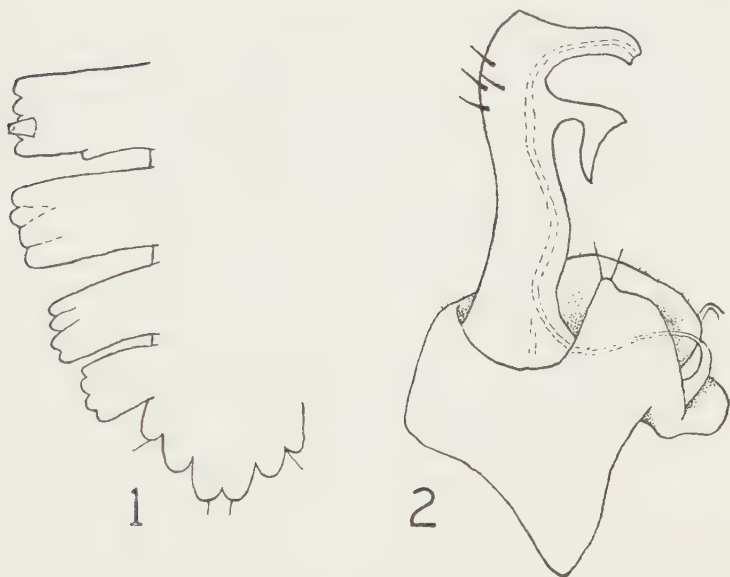
Figs. 1, 2

Diagnosis: Nearest *sodalis* Schubart in the structure of the gonopods and the body size; distinguished from that species by the lighter body color, the presence of radii on the margin of the collum, and the more prominent primary tubercles on the collum.

Type specimens: Male holotype and female paratype, American Museum of Natural History; male and female paratypes, United States National Museum and the author's collection.

Type locality: Gruta el Silvino, near Cayuga and Puerto Barrios, Guatemala; 3 ♂♂, 4 ♀♀; collected 13 June 1959, about 600 feet within the cave by W. W. Varnedoe, Jr.

Description of the male holotype: Color in alcohol whitish except for the pale yellow tubercles. Length about 9.5 mm, width 1.7 mm. Head covered by collum when viewed from above. Dorsum strongly arched and the paranota set low, their ventral surface almost horizontal. Seg-



FIGS. 1, 2

ments 1 and 2 very close together; remainder of body loose-jointed, with the length of the exposed parts of the prozonites of segments 4 through 14 as great as the length of the metazonites of those segments. Legs extend to lateral margin of paranota if straightened out. Metazonites thickly covered with short, fine, glassy spicules. Vertex of head with a rectangular granular area that is indistinctly divided into four vertical columns. Antennae short, the fifth segment thickened and twice as long as segment 6; segments 5, 6, and 7 each with a small pad of fine setae on the distolateral surface.

Collum with 12 marginal lobes, of which the outer three on either side are slightly smaller and less evenly formed than the intervening lobes; radii are between all of the lobes. Disk of collum strongly convex; the ten primary tubercles are large and in two rows; the outer primary tubercle is slightly smaller than the intervening ones. The secondary tubercles of the collum are arranged in an even row of 18 on the caudal margin; others are arranged irregularly around the primary tubercles; they do not extend out on the margin between the radii.

Segments 2 through 19 have the primary tubercles arranged in four rows of three tubercles on each segment; they are slightly smaller on the last few segments. On typical segments the primary tubercles in the medial rows are rounded and elongated transversely and those in the lateral rows are slightly smaller, conical, and rounded at the apex. The secondary tubercles of segments 2 through 19 are arranged as follows: two rows of four each between the medial primary tubercles, from three

to seven in one or two irregular rows between the medial and lateral primary tubercles, and about 20 laterad to the lateral primary tubercles and on the paranota. Surface of caudal segment granular. Lateral margin of segments 2 through 5 with three subequal lobes, segments 6 through 19 with four subequal lobes, and segment 20 with six subequal lobes, of which the middle two are closer together than the others (Fig. 1). One or two secondary lobes are on the caudal margin of the paranota of most segments. The pore cones are white; they cover the second lobe of segment 5 and the third lobe of segments 7, 9, 10, 12, 13, 15, and 16 and project slightly beyond the lateral margin of the adjacent lobes.

In situ the telopodites of the gonopods are freely exposed and directed caudad. The solenomerite crosses its homologue near the apex and the apex of the acute angle of the tibiotarsus is contiguous with its homologue. The large coxae are connected by a small piece. The sharply bent tibiotarsus (Fig. 2) distinguishes this species from others of the genus except *sodalis*; the femoral region is less curved than in that species. Anterior to the gonopods is a small, medial sternal peg.

Paratypes: The largest female paratype is 10.7 mm long and 1.8 mm wide; other somatic characters are as described for the male holotype. One male differs from all of the other specimens in the series in that the lateral lobes of segments 17 and 18 are less evenly formed, with four on one side and five on the other side of both segments.

Since the description of so many Central American species is inadequate, the determination of the three following species will be deferred until type material can be studied.

A female tentatively identified as *Scaphiostreptus* (S.) *discriminans* (Chamberlin 1922) was collected in total darkness a linear distance of about 450 feet from the entrance of Cueva Lanquín, 1 km northwest of the village of Lanquín and about 25 km east of Cobán, Department of Alta Verapaz.

A male and a female of the subgenus *Scaphiostreptus* were collected either near the entrance or about 300 feet from the entrance of Cueva Jobitzinaj, 3 km south of Flores, which is on Lago Petén, Department of Itza.

A large female of the genus *Siphonophora* was collected about 100 feet from the entrance of a small cave in volcanic ash, La Cueva Camán, which is near Lago de Atitlán. It is evenly pale yellow, about 45 mm long, 1.9 mm wide, and has 108 body segments. It resembles *S. globiceps* Pocock 1903 but differs in that the beak is slightly longer and the anterior margin of the collum is slightly concave.

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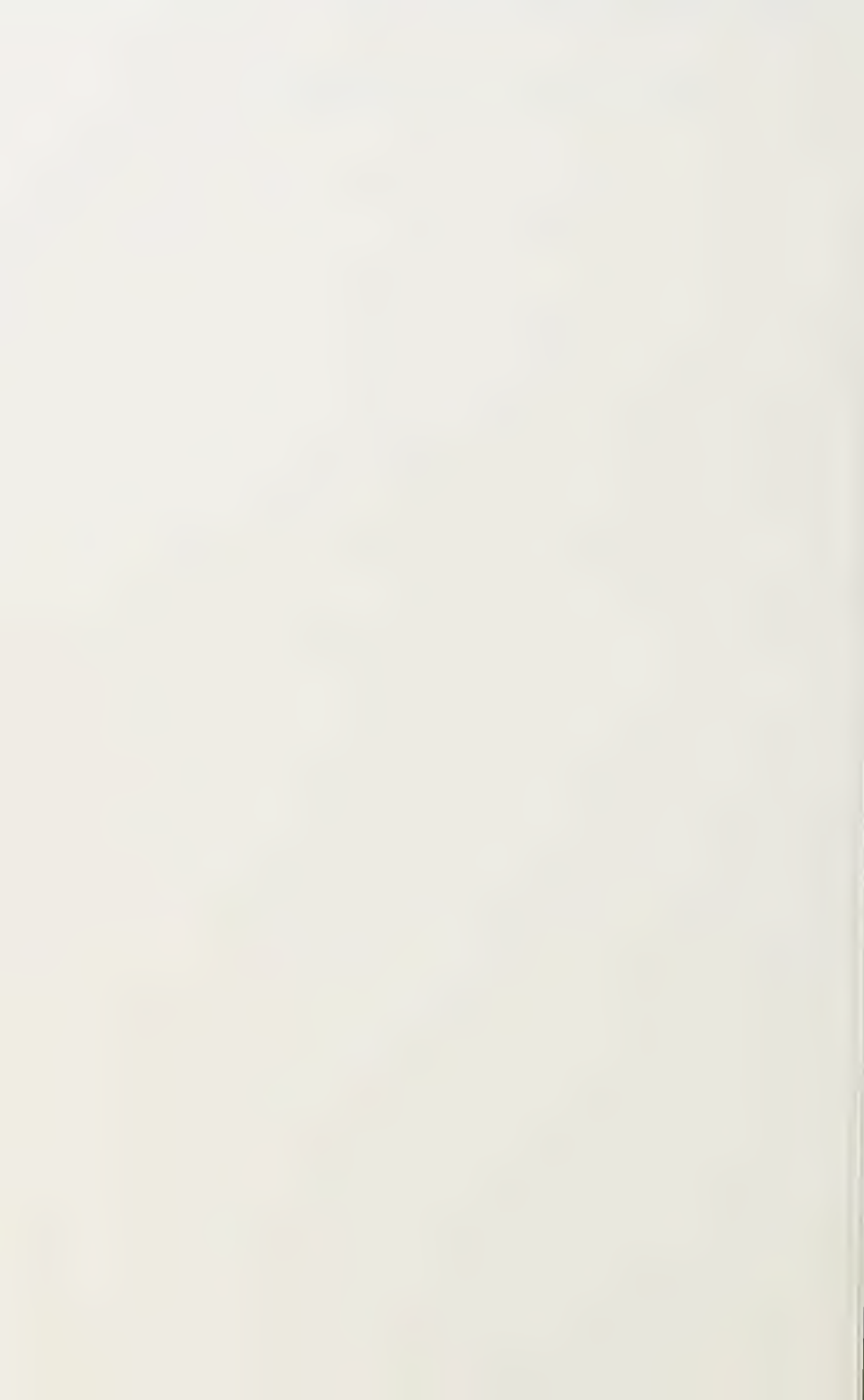
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EXPLANATION OF FIGURES OF *CALYMMODESMUS INQUINATUS*

Fig. 1.—Outline of the last five body segments, female paratype.

Fig. 2.—Left gonopod, anterior view, male paratype.



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GARMANNIA SAUCRA, A NEW GOBIID FISH FROM
JAMAICA¹

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Among the fishes collected recently in Jamaica by John E. Randall and associates was a single specimen of a distinctive but undescribed goby of the genus *Garmannia*. This species is described below. I am indebted to James E. Böhlke and Ernest A. Lachner for comments concerning the manuscript. The photographs are by Walter R. Courtney, Jr. The holotype is deposited in the Academy of Natural Sciences of Philadelphia.

***Garmannia saucra*, new species**

Fig. 1

Holotype: ANSP 92985, an adult female, 15.9 mm standard length collected at South Cay, Jamaica, 3 miles south of Port Royal, north side of cay in 3-5 feet of water, 18 December 1959, by John E. Randall, T. Chess, and D. Steven (field number: CRR-Car-5).

Diagnosis: A strikingly spotted species of *Garmannia* with reduced squamation (4 transverse rows on caudal peduncle and a vertical basicaudal row of four modified scales). Fin-ray formula: spinous dorsal fin-VII; second dorsal fin-I, 10; anal fin-I, 9; pectoral fin-15-15; segmented caudal rays-17, branched caudal rays-11.

Description: The pallid body is conspicuously dark-spotted (see Fig. 1); the single series along the lower sides consists of 12 vertically elongate blotches, well separated from the dorsal series. The caudal base is outlined by a dark curved mark. Along the mid-dorsal line are 13 dark spots extending from the nape to the dorsal insertion of the caudal fin. A dorso-lateral series of 12 dark spots extends from the area just dorsad of the operculum to the caudal peduncle. The dorsolateral and mid-dorsal series merge under the posterior portion of the soft dorsal fin. A dark diagonal bar crosses the pectoral-fin base. The head is irregularly marked, the pattern showing lateral asymmetry. The anterior narial tubes are black.

¹ Contribution No. 281 from The Marine Laboratory, University of Miami.

All fins are unmarked. Life colors are unrecorded but presumably are much the same as in the preserved specimen (related species lack bright life colors).

The seven spines in the first dorsal fin are arranged as in all other species of *Garmannia* (and many other gobiid genera); the anterior five are equally spaced and spines 6 and 7 are about twice as remote from each other and from the first five spines. Such spacing characteristically results (in other gobiids studied by the writer) from two vertebrae lacking interneural elements and also the spines that would attach to them. The typical gobioid formula is 1 ray to 1 interspinal series to 1 vertebra. Many illustrators have ignored or overlooked this staggered placement of first-dorsal elements and so its occurrence through various phyla of gobioid fishes cannot be easily traced from current literature.

No spines are elongate in the type but it is a female. Presumably males will have one or several elongate spines as in all other species of *Garmannia* (except *parri*).

Eleven elements are in the second dorsal fin, one spine and ten soft rays, the last split to its base. One dorsal ray is branched near its tip. The anal fin contains one spine and nine soft rays, the last split to its base. Several anal rays are branched. The pectoral fins are damaged but both contain 15 rays, all of which are branched except for the upper one or two and the lowest.

The pelvic disc is complete, its central rays are longest and the interspinal frenum is well developed forming a definite basal cup. The caudal fin is nearly truncate behind with rounded corners. As in many gobiids, there are 17 segmented caudal rays, 11 of which are branched.

Head pores are present and well developed. Two are on a vertical canal (the preoperculomandibular canal of other fishes) along the margin of the preopercle. One is on the lateral canal above the anterior margin of the opercle. Each supraorbital canal contains four pores, one behind the eye opposite the posterior dorsal quadrant, two median pores on the interorbit, the posterior one on a line even with the hind margin of the eye, the anterior on a line even with the anterior margin of the pupil, and the fourth pore slightly anterior and mesial to the posterior nostril. One pore, behind the eye near or slightly above is midpoint, is in the infraorbital canal. No head pore is tubular. The posterior nostril is a large opening near the anterior rim of the orbit. The anterior nostril opens through a well-developed tube.

Squamation is reduced in *saucra*. There is the usual vertical row of four modified scales along the caudal-fin base. Four moderate-sized scales are present in a row on the mid-side of the caudal peduncle. They are non-imbricate and strongly ctenoid, their posterior margin being nearly as decorative as the scales on the caudal-fin base. The anterior scale is alone but the posterior scale is in a row of three, and the next in a row of two. In all only seven or eight scales (the two sides differ) are present on each side of the caudal peduncle anterior to the vertical row along the caudal-fin base.



Dentition is confined to the jaws. The dentary patch is several rows broad, the outer enlarged with its posterior members largest but not caninoid. The patch in the upper jaw is perhaps narrower, again with the outer row largest and without canines. The tongue is short and is truncate anteriorly.

The general body form is best seen in Fig. 1. Lengths of body parts expressed as per cent of standard length (15.9 mm) are: head length—27; horizontal eye diameter—6.9; depth of body at (1) origin of spinous dorsal fin—19, (2) origin of anal fin—16; caudal-fin length—23; pelvic-fin length—21. Both pectoral fins were broken but apparently reached to the level of the anus.

The name *saucra* is from the Greek for graceful, pretty.

Discussion: The following species are currently assigned to *Garmannia* in western Atlantic waters. *G. macrodon* (Beebe and Tee-Van), *G. zebrella* Robins, *G. pallens* Ginsburg, *G. gemmata* Ginsburg, *G. schultzi* Ginsburg, *G. spes* Ginsburg, *G. hildebrandi* Ginsburg, *G. mediocricula* Ginsburg, *G. spilota* Ginsburg, and *G. hemigymna* (Eigenmann and Eigenmann).

G. spes and *G. schultzi* differ sharply from *saucra* in lacking the basicaudal row of modified scales and in having more (9–16) lateral scale rows. *G. hemigymna* has many scale rows (the scales continuing forward nearly to the axil of the pectoral fin), a barbel below the posterior nostril, more (19) pectoral rays and canine teeth. (*G. hemigymna* is here removed from the genus *Risor*).

G. spilota, *G. hildebrandi*, *G. mediocricula* and the Pacific *G. chiquita*, *G. paradoxa* (Günther) and *G. homochroma* all have extensive (about 25–34 transverse rows varying with the species) squamation and more pectoral rays (from 16–18 in *hildebrandi* to 21 in *mediocricula*).

The relations of *saucra* lie with the “subgenus” *Tigrigobius*, which contains *macrodon*, *zebrella*, *pallens*, and (fide Ginsburg, 1933: 55) *diguetti* of the Eastern Pacific.

G. macrodon and *G. zebrella* are distinctly banded, and they possess canine teeth, a moderately high number (16–18 and 18–19 respectively) of pectoral rays. *G. pallens* is less banded than *macrodon* and *zebrella* (Böhlke and Robins, 1960: Pl. 3B) but is scarcely spotted. Also *pallens* has more scale rows (8–13). *G. gemmata* has more second dorsal elements (12–13), more scale rows (5–8, dorsally 8) and it has spotted dorsal and caudal fins.

Austrogobius de Buen (1951: 64–67, Pl. 1) erected for *Gobiosoma parri* Ginsburg should be placed in the synonymy of *Garmannia* and it may be close to or the same as the “subgenus” *Tigrigobius*. Its subgeneric status remains uncertain. *G. parri* differs from *saucra* in having a high number (21) of pectoral rays, and banded coloration and supposedly in the arrangement of papillae and pores on the head.

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EXPLANATION OF FIGURE

Fig. 1.—ANSP 92985, female holotype of *Garmannia saucra*, 15.9 mm in standard length.

